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GRANITE

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ALPS

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: ARGO **PA#:** 20-081

Date: July 6, 1994 **Time:** 1015-1500

Field Team Leader: Tuesday, Pioneer

Sampling Personnel: Belanger, West; Pioneer

Visitors: None

Weather/Seasonality Observations: In morning, drizzle/rain and cool; by mid-afternoon, partly cloudy and warm; slight breeze; rained the entire night before this investigation; dry, hot summer.

Photographic Log **(Film Roll and Photo No.'s/Video Tape Number):** #9: SW-1 sample location; #10: SW-3 sample location; #11: WR-1 and WR-2 from lower road; #12: SW-2 sample location; #13: TP-1 (right) and TP-2 (center); #14: WR-1 from road facing northwest; #15: WR-2 from road facing northwest; #16: Adit #1 discharge (HMO).
Video Tape No. 2

General Comments/Observations **(not covered specifically in attached Inventory Forms):** Adit discharge has high pH, low SC, and is routed around dump materials. Dumps are > 100' from Harvey Creek. Very small volume of tailings present, but road cut through them (caving into road).

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Route discharge away from wastes; consolidate, contour, amend, and revegetate wastes.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): ARGO **PA#:** 20-081

Legal Description: **T** 10N **;R** 16W **;Sec.** 35 , SW **1/4** NE **1/4** ____ **1/4**

County: GRANITE **Mining District:** ALPS

Latitude: N 46° 34' 50" **Longitude:** W 113° 34' 10"

Primary Drainage Basin and Code: Clark Fork River/17010201
Secondary Drainage Basin: Harvey Creek

USGS Quadrangle map name(s): Spink Point

Mine Type/Commodities: Hardrock/Gold, Silver

Activity Status: **Active** ___, **Inactive/Exploration** X , **Abandoned** ___.

Ownership: Known Y ___ **N** X **; private/public?** Private
Owner, Agent, or Contact (Include address and phone when available) **:** Unknown

Relationship to other mines/sites in the area/district: Southeast of Alps and Jumbo Mines; 3 miles south of Edelman Mine

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? N/A

General site features: Elevation 6760'-7160', **Slope** 24° ,
Aspect South

Land use: Mining X , **Recreational** X , **Residential** ___, **Urban** ___,
Agricultural ___, **Other(Specify)** Logging

Area of disturbed/unvegetated lands? 0.5 **acre(s).**
Site Dimensions: 200 feet x 200 feet

Predominant vegetation types: Douglas fir

Access: roads - good (paved) ___, **poor (maintained dirt road)** ___,
4wd X , **trail** ___.
Other logistical considerations (proximity to other sites).
Southeast of Alps Mine.

Well logs within 1 mile radius; **(Attach MBMG Well Log Printout(s):** There is 1 well reported within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site is in headwaters of Harvey Creek; adit is located at the head of Harvey Creek and shaft is located at the head of Brewster Creek. Sixteen miles downstream, Harvey Creek enters the Clark Fork River near Bearmouth.

Mining/milling history, ore type/tenor, host rock, gangue: Literature states that the mine has not been operated for a number of years. No other information available.

Mine Operation?

Shafts - **Yes** X, **No** ___, **#** 1, **Comment** Caved

Adits - **Yes** X, **No** ___, **#** 1, **Comment** Partially backfilled; with 3' of impounded water

Pits - **Yes** ___, **No** X, **#** ___, **Comment**

Placers - **Yes** ___, **No** X, **#** ___, **Comment**

Other - **Yes** X, **No** ___, **#** 3, **Comment** Small exploration trenches

Mill Operation? **Yes** X, **No** ___. **If yes answer the next three questions:**

Period(s) of Operation: Possibly from 1934 to 1935

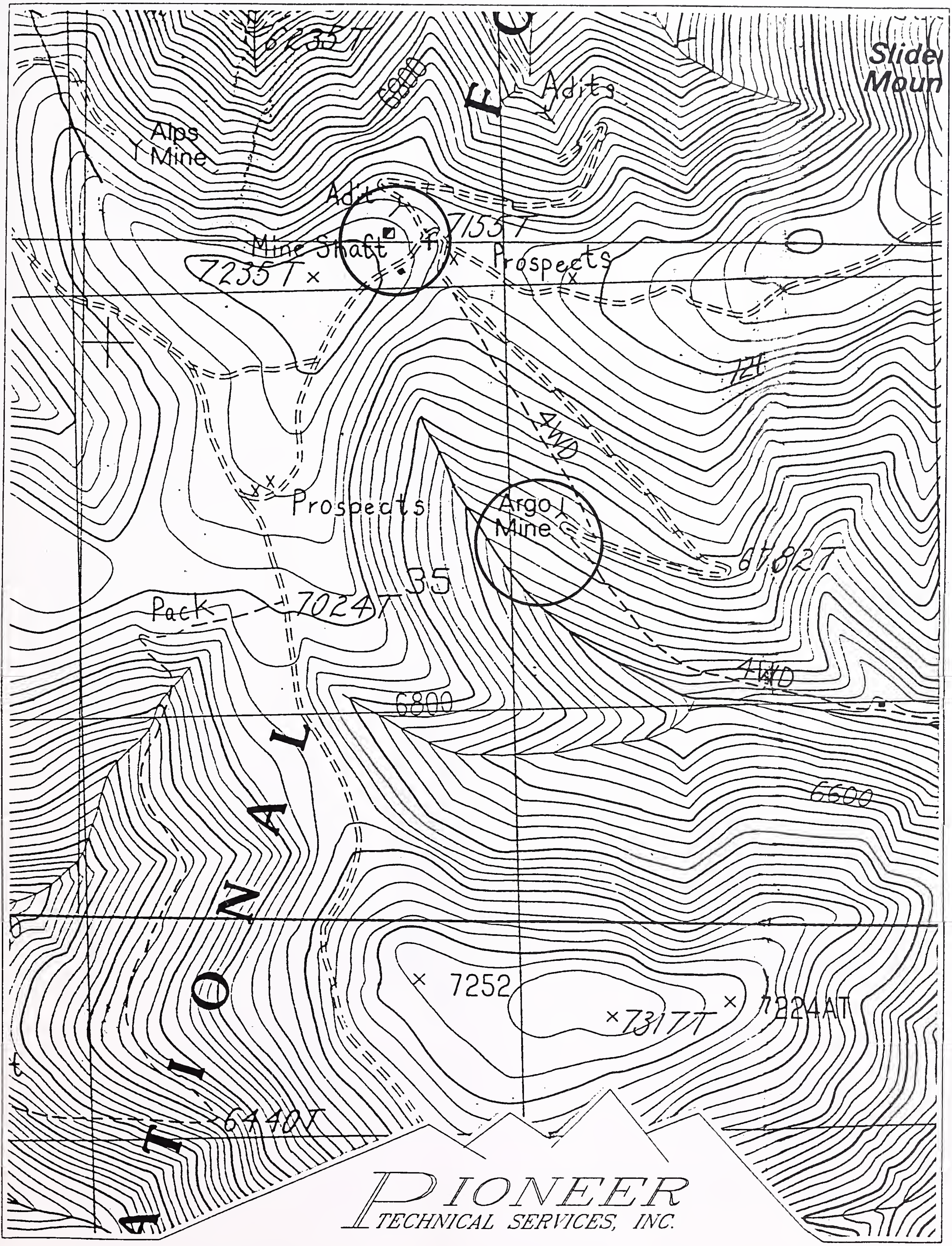
Origin of Ore Milled - Custom Mill ___ **Dedicated Mill** X; **Number and names of mines that supplied mill feed:**

Process? Hg-amalgam, CN$^-$ leach (vat, heap), floatation, smelting? Unknown

Montana Bureau of Mines and Geology
Water Well Log Data

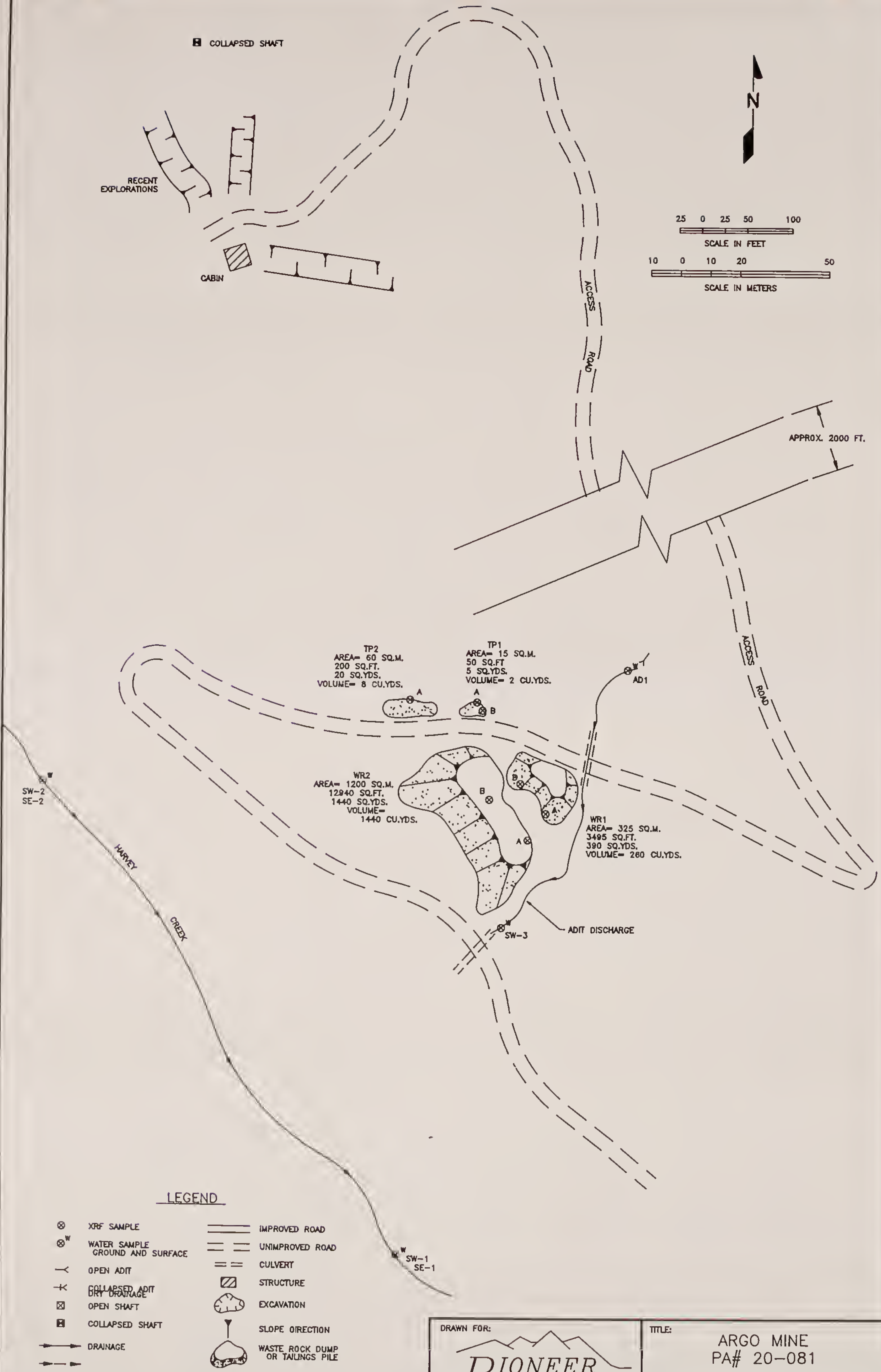
08/10/1994

Well No.	Location	Depth	Yield	Static Water Level
:131335	10N 16W 35 AD	272.0	35.0	160.00



PIONEER
TECHNICAL SERVICES, INC.

ARGO, P.A. NO. 20-081
T10N, R16W, SECTION 35
SCALE: 1" = 1000'



DRAWN FOR:

PIONEER
TECHNICAL SERVICES, INC.

TITLE:

ARGO MINE
PA# 20-081

DRAWING NO.: PT340217 REV: -
DATE: 11/19/94 PLOT SCALE: 1 - 30

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. **Waste Characteristics** - *Use table on following page.*

Unique source identification: (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures/vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. **TAILINGS IMPOUNDMENTS** - *If tailings impoundments are also present, complete the following questions.*

Describe the tailings grain size distribution (approximate % sand, silt, & clay): TP-1 is silt and silty clay; TP-2 is sandy silt.

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): TP-1 has 9" depth; not an impoundment, only remains of a vat. TP-2 is approx. 2.5' at deepest (south) end; placed in a natural basin that has been cut by the road.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Dry

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): Not impounded at all, free to migrate onto road and downhill.

Comments on potential for mitigation: Small volume with good pH and relatively low metals; easy to move or revegetate.

SOURCE INVENTORY FORM

SAMPLERS: Tuesday, West

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
TP-1A	TAIL	2	East tailings in former vat; 0-6"	None	5.3 (D)	0.04	20-081-TP-1	07/06/94 1730	T-Metals, ABA
TP-1B	TAIL		East tailings in former vat; 6-9"	None	5.2 (D)	0.04			
TP-2	TAIL	8	West tailings along road; 0-2.5'	None	6.4 (D)	0.03			
WR-1A	WR	260	East side of upper dump	None	6.4 (D)	0.04	20-081-WR-1	07/06/94 1400	T-Metals, ABA
WR-1B	WR		West side of upper dump	None	6.6 (D)	0.03			
WR-2A	WR	1,440	East side of lower dump	None	4.7 (D)	0.06			
WR-2B	WR		West side of lower dump	None	6.2 (D)	0.06			

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 20-081-TP-1 is composite of TP-1A and -1B, and TP-2. 20-081-WR-1 is composite of WR-1A and -1B, and WR-2A and -2B. See the Alps Mine (22-065) for background soil sample (1993 inventory data).

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map

Flowing adits: **Yes**_X_, **No**____, **Number:**_1_ **Identification:**_Adit associated with WR-1_

Filled shafts: **Yes**___, **No**_X_, **Number:**____ **Identification:**____

Seeps/Springs: **Yes**_X_, **No**___, **Number:**_1_ **Identification:**_SW-3; below mine dumps before contact with road_

Groundwater wells within 4 miles?: **Yes**_X_, **No**___;
Number of well logs:_32_

Distance to nearest well used for drinking:
___**<1,000 ft;**___**1,000 ft to 0.5 miles;**_X_**>0.5 miles.**

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, **Probable**____, **Possible**_X_, **Unlikely**____.
Uncontained sources and shallow groundwater indicated by adit discharge.

Approximate Depth to Groundwater:_X_**<25 ft;**___ **25 - 100 ft;**___ **>100 ft.**

Other observations/notes:_Water backed up in adit is approximately 3 feet deep; seeps out of caved rock pile._

GROUNDWATER INVENTORY FORM

SAMPLERS: Belanger

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
AD-1	AD	Discharge from adit associated with WR-1 and WR-2	12 gpm (E)	6.6	52	N/A	5.6	14	N/A	20-081-AD-1	07/06/94 1300	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): Water impounded behind caved material was approximately 3 feet deep.

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: **Yes** X , **No** ____ , **Name(s):** Harvey Creek

Dry streambeds: **Yes** ____ , **No** X , **Name(s):** ____

Other surface water: **Yes** ____ , **No** X , **Name(s)/Description:** ____

Waste materials within any floodplain: **Yes** ____ , **No** X **Source ID(s):** ____

Approximate Flood frequency? ____ **1 yr,** ____ **10 yr,** ____ **100 yr**

Estimated seasonal flow of stream(s) (cfs/gpm)? N/A
High Flow: ____ , **Average Flow:** ____

Distance between waste source(s) and nearest surface water body (ft)? 150 feet

Surface water draining onto or through waste sources: **Yes** X , **No** ____ ,
Describe: Discharge from adit flowed partially over WR-1 and down side.

Surface water use within 15 miles downstream? **(Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)**
Harvey Creek has possible fishery and wetland.

Observed erosional/sedimentation/stream turbidity problems? Yes ____ ,
No X . **Distance downstream (ft)? 0-500** ____ ; **500-1,000** ____ ; **>1,000** ____ .
Describe/explain **(Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):** Note placer workings in Harvey Creek below mine.

SURFACE WATER INVENTORY FORM

SAMPLERS: Tuesday, Belanger

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	Downgradient of site in Harvey Creek	7.43	36	6.8	15	0.38 cfs (M)	20-081-SW-1	07/06/94 1130	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-1	SE	Downgradient of site in Harvey Creek	N/A	N/A	N/A	N/A	N/A	20-081-SE-1	07/06/94 1130	T-Metals
SW-2	SW	Upgradient of site in Harvey Creek	7.49	25	6.5	10	0.12 cfs (M)	20-081-SW-2	07/06/94 1200	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-2	SE	Upgradient of site in Harvey Creek	N/A	N/A	N/A	N/A	N/A	20-081-SE-2	07/06/94 1200	T-Metals
SW-3	SW	Seep 30' below the toe of WR-1	7.7	38	8.3	9	5 gpm (E)	20-081-SW-3	07/06/94 1230	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SW-4	SW	In stream above adit that flowed into adit discharge	7.21	19	8.5	N/A	2 gpm (E)	N/A	N/A	Field Parameters

*FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ____________________

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides? (SO_3)

Presence of evaporative salt deposits? (ESD)

Discolored or turbid seepage? (SPG)

Presence of long filamentous algae in drainages, mosses in moist areas?

Presence of ferric hydroxide precipitates? (FEOX)

Presence of burned or stressed vegetation? (VEG)

pH ≤ 5.0 (pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? < 2 acres

Wetlands present: Yes___, No X , Describe:

Carbonate rocks/soils: Yes___, No X , Describe:

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30 X ; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments

Nearest residence:___<1,000 ft;___1,000 ft - 0.5 miles; X >0.5 miles.

For each source (table next page):

Available fine materials? *Surface area?*

Uncovered and unvegetated? *Wet or dry?*

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Tuesday, West

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
TP-1	None	Dry	50	50	Yes	Moderate
TP-2	None	Dry	200	200	Yes	Moderate
WR-1	FEOX	Dry	3,495	3,150	Yes	Low
WR-2	FEOX; pH	Dry	12,940	9,060	Yes	Low
AD-1	FEOX	N/A	N/A	N/A	N/A	N/A

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No_X_
Describe:____________________

Population within 1 mile: 1-10_X_; 10-30___; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments____________________

Evidence of recreational use on site: Yes___, No_X_, Describe:________

Accessibility (check each that apply):_X_Easily accessible - no fences, gates, or warning signs;___Moderately Accessible - barbed wire fences, road gated, or signs posted;___Difficult Access - chain-link fence, road gated and locked, site guarded (does not include locked or manned access points located more than 0.5 miles from the actual site).

Sensitive environments on-site or adjacent to site:
State or National Parks - Yes___, No_X_, Comment____________
Wilderness Area - Yes___, No_X_, Comment____________
T&E Species Habitat - Yes_X_, No___, Comment_Bald Eagle_____
Bat Habitat - Yes___, No_X_, Comment____________

Primary Drainage_X_; Secondary Drainage___; No Information___:
Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium_X_, Low___
Fisheries Habitat and Species Classification - _1_
Sport Fishery Classification - _3_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, No___, Number_1__, types and locations:___
Adit associated with WR-1

Hazardous structures: Yes___, No_X_, Number____, types and locations:_

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____, types and locations:____________________

Unstable waste piles, impoundments, undercut banks: Yes____, No_X_, Number____, types and locations:____________________

Fire and/or Explosion hazards: Yes___, No_X_, Explain:____________

Bibliography

MBMG, Well Log Database, July 14, 1994.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Argo, Prepared by Northern Engineering and Testing, July 23, 1987.

USGS, Topographic Map, Spink Point, Montana, 7 1/2 minute Quadrangle, 1989.

LABORATORY ANALYTICAL DATA

ARGO
PA NO. 20-081

MDSL AMRB/PIONEER 5/16/94

Argo PA# 20-081
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 07/06/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-081-SE1	0.5 U	9.8 J	345	0.6 J	66.7	3.5 J	23.3 J	24700	0.08 J	2570	44.3 JX	7.2 U	5.8 UJX	54.7	NR
20-081-SE2	0.6 U	10.5 J	556	0.6 UJ	14.0	2.5 J	16.8 J	18300	0.06 J	1290	13.3 JX	8.2 U	6.6 UJX	16.8	NR
20-081-TP1	1.3	36.0 J	2840	0.5 UJ	1.6 U	9.5 J	13.6 J	25600	0.29 J	27.3	1.5 UJX	460	5.3 UJX	28.2	NR
20-081-WR1	0.4 U	29.3 J	316	0.4 UJ	2.6	1.2 J	3.6 J	23100	0.33 J	183	1.5 JX	33.4	4.5 UJX	29.1	NR
BACKGROUND	NR	19 JX	415	0.6 U	2.4 J	4.6 J	5.6	17300 J	0.067	985 J	8 J	12 J	4 U	26 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
20-081-TP1	0.23	7.19	-0.71	-7.90	0.16	0.04	0.03	1.25	-1.96
20-081-WR1	0.24	7.50	-0.59	-8.1	0.21	0.01	0.02	0.31	-0.90

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
20-081-AD1	0.12 U	1.1 U	184	2.6 U	8.7 U	4.7 U	4.6 U	438	0.11 U	108	8.0 U	0.6	34.1 JX	10.5 JX	18.7
20-081-SW1	0.12 U	1.1 U	80.2	2.7	8.7 U	4.7 U	4.6 U	61.1	0.11 U	18.3	8.0 U	0.4 U	31.0 JX	4.5 UX	12.3
20-081-SW2	0.12 U	1.1 U	90.5	2.6 U	8.7 U	4.7 U	4.6 U	24.4	0.11 U	4.4 U	8.2	0.5	50.0 JX	4.5 UX	9.0
20-081-SW3	0.12 U	1.1 U	80.5	2.6 U	8.7 U	4.7 U	4.6 U	360	0.11 U	11.0	8.0 U	0.8	45.4 JX	10.5 JX	11.9

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
20-081-AD1	49	<5.0	11	11	NR
20-081-SW1	44	<5.0	8.0	0.05	NR
20-081-SW2	34	<5.0	<5.0	0.07	NR
20-081-SW3	15	<5.0	7.0	0.12	NR

LEGEND

SE1 - Downgradient of the site in Harvey Creek.
SE2 - Upgradient of the site in Harvey Creek.
TP1 - Composite of the subsamples TP1A and 1B.
WR1 - Composite of the subsamples WR1A, 1B, 2A, and 2B.
BACKGROUND - From the Alps Mine (22-065-SS1) (1993 Data).

AD1 - Discharge from adit associated with WR1 and WR2.
SW1 - Same as sample 20-081-SE1.
SW2 - Same as sample 20-081-SE2.
SW3 - Seep 30' below the toe of waste rock dump #1.

XRF ANALYSIS RESULTS

ARGO
PA NO. 20-081

Mine Name: Argo PA# 20-081
XRF Field Analyses
Results in PPM

XRF SAMPLE I.D.	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Ni	Cu	Zn	As	Sr
20-081-TP1A		24457.7	1426.69	1458			31908.4				129.03 *		27.8382 *
20-081-TP1B		27768.4	1592.21	1827.08			44304.9				159.252 *		33.3401 *
20-081-TP1-COMP		19701	1286.23	1078.71			28520.2				137.462 *	90.7722 *	16.8614 *
20-081-TP2		16317.9	1390.87	875.898			23360.1				98.0721 *	77.726 *	13.384 *
20-081-WR1A		33919.9	3268.63	2638.58		1134.49 *	39061.7				155.377 *	80.5607 *	20.4612 *
20-081-WR1B		36507	1653.97	2820.76		506.415 *	53961.2				142.715 *	117.24 *	31.266 *
20-081-WR1-COMP		38103.7	1885.22	2844.96		806.024 *	54704.7				144.574 *	138.07 *	19.6244 *
20-081-WR2A		40235.9	1579.19	2914.85		779.78 *	60900.7				142.962 *	171.449 *	18.0426 *
20-081-WR2B		40954.2	1554.77	3020.65		785.932 *	57160.6				128.351 *	159.452 *	22.4968 *

XRF SAMPLE I.D.	Zr	Hg	Mo	Pb	Rb	Cd	Sn	Sb	Ba	Ag	U	Th
20-081-TP1A	233.624		102.056	335.434	111.489			59.8047 *	3049.45			12.6667 *
20-081-TP1B	231.137	120.692 *	132.918	489.166	131.662				2661.97			
20-081-TP1-COMP	192.972	59.9654 *	96.623	248.845	102.972	146.257 *			2205.68			
20-081-TP2	171.16		59.4968	99.3309 *	77.1321				972.534			13.1849 *
20-081-WR1A	347.869				182.005				512.131			17.8218 *
20-081-WR1B	301.893		75.4056	172.768	177.268	157.601 *			1834.62			18.5994 *
20-081-WR1-COMP	313.345		25.228 *		176.697	243.508 *			828.605			13.1088 *
20-081-WR2A	302.318		18.2837 *		165.32				1120.02			11.233 *
20-081-WR2B	302.215		24.9783 *		171.203	180.798 *			1026.83		18.6818 *	13.6986 *

* = Estimated Quantity

$ = Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

ARGO
PA NO. 20-081

AIMSS SCORESHEET

SITE NAME: Argo
PA NUMBER: 20-081

LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	2.335
6	GW - TARGETS	WELLS - 1 MI. x 2.5		2.5
7		WELLS - 1 TO 4 MI		31
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	33.5
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	31289
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
12		EXCEEDENCES		50
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	450
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	2.401
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19		FISHERY		20
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		5
23		TARGETS SCORE	SUM LINES 16 THRU 22	42
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	45379
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.007
29	AIR - TARGETS	POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		5
34		TARGETS SCORE	SUM LINES 29 THRU 33	25
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	9
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		0
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.006
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		1
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 THRU 42	1
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	1
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE (LINES 10 + 24 + 35 + 44) / 100,000			0.77

SITE NAME: Argo
PA NUMBER: 20-081

SITE SAFETY

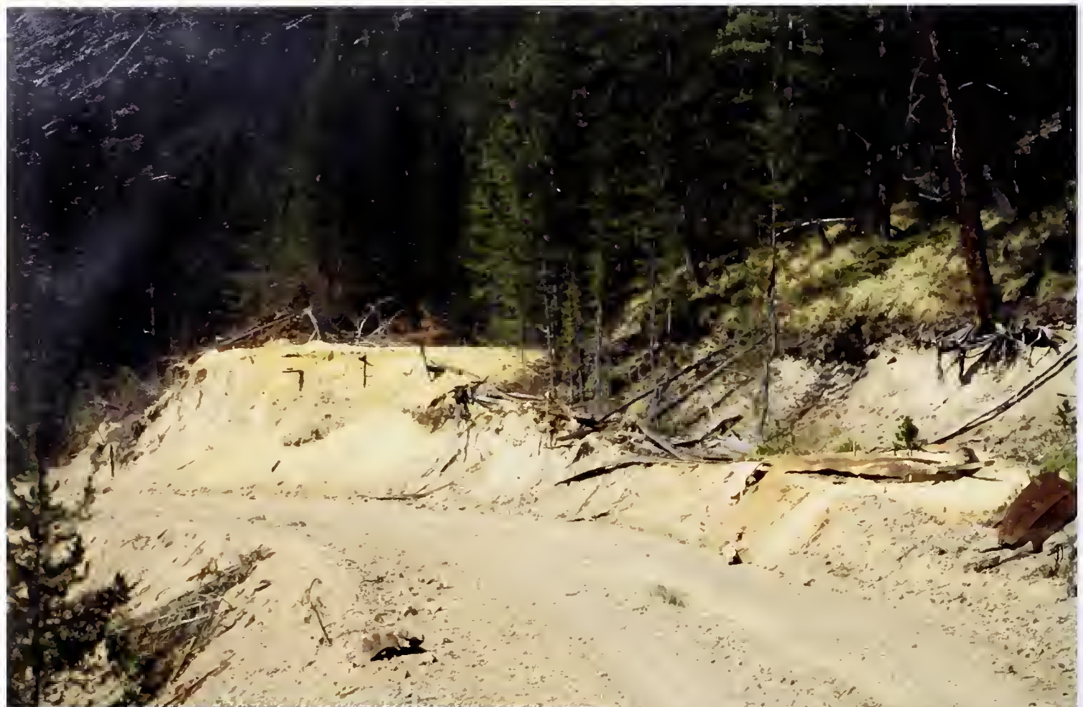
LINE NO.				
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	50
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	50
9		POPULATION - 1 MILE		1
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 THRU 11	1
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	1.00

20-081, #9: SW-1 sample location

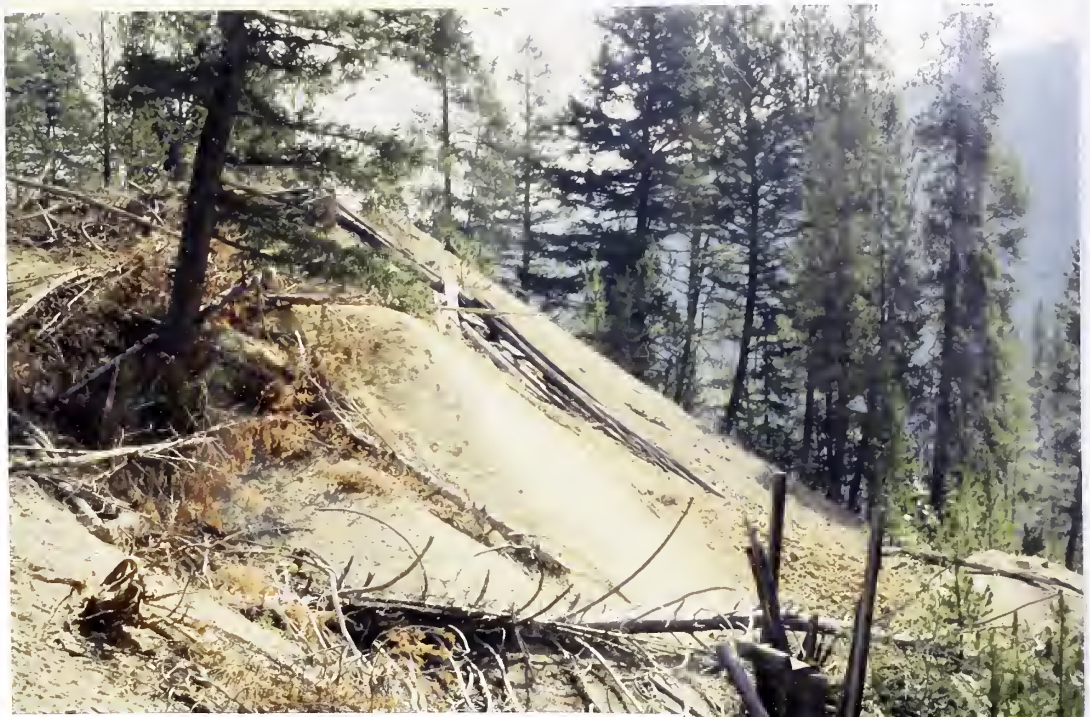
20-081, #10: SW-3 sample location

20-081, #11: WR-1 and WR-2 from lower road

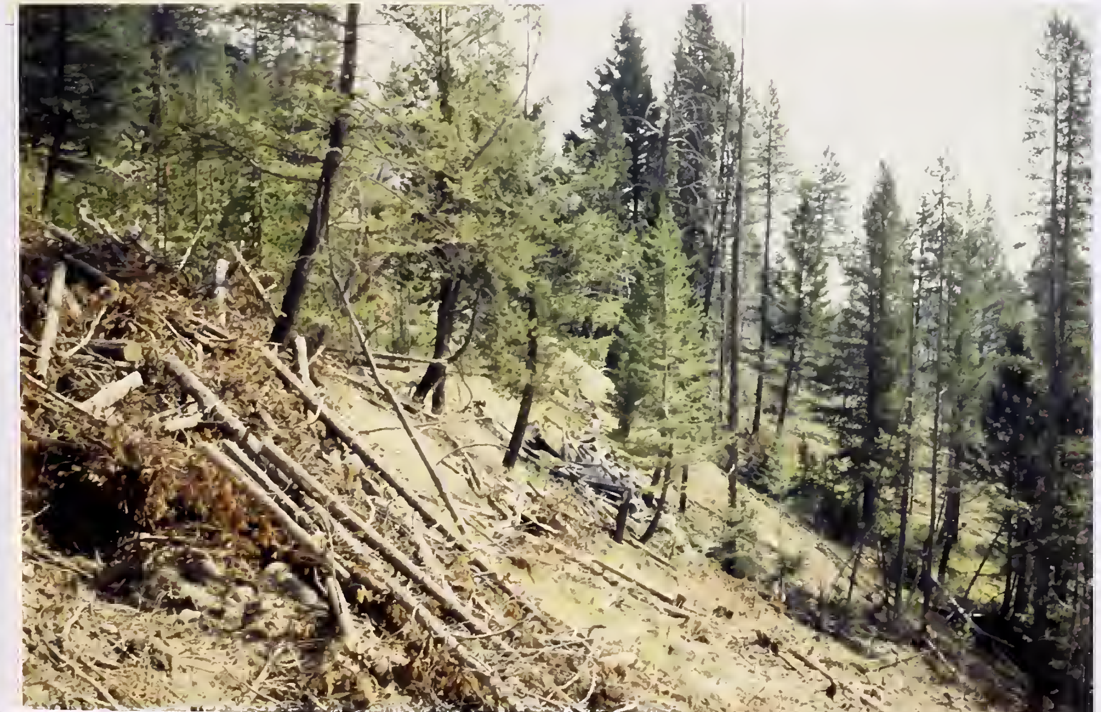
20-081, #12: SW-2 sample location



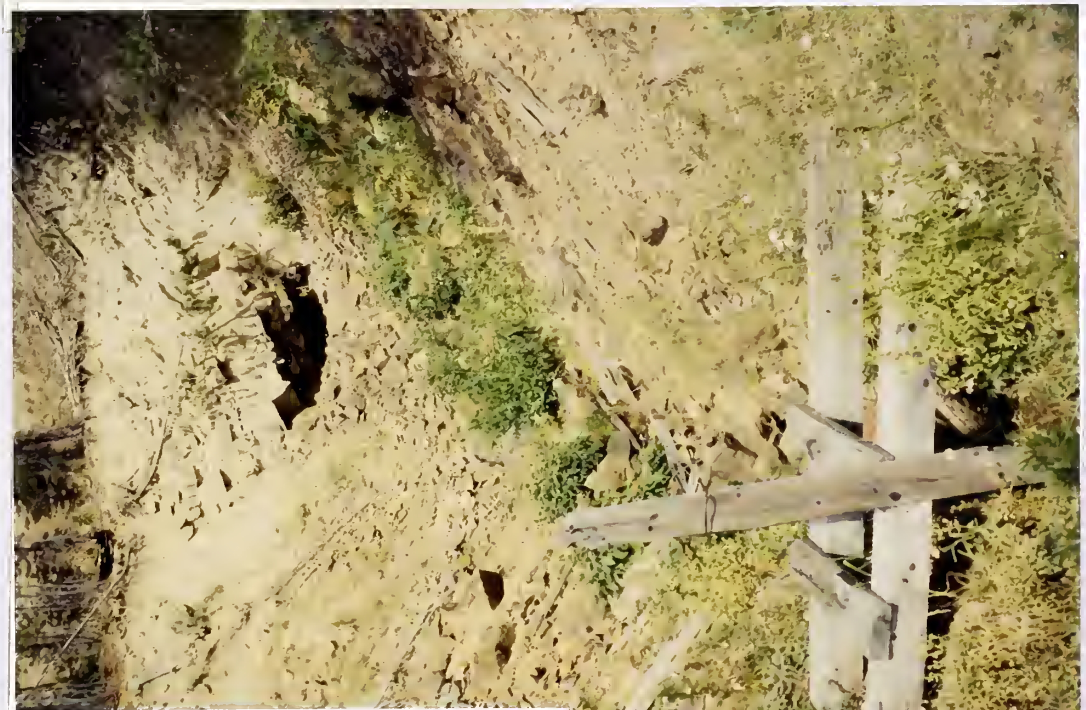
20-081, #13: TP-1 (right) and TP-2 (center)



20-081, #14: WR-1 from road facing northwest



20-081, #15: WR-2 from road facing northwest



20-081, #16: Adit #1 discharge (HMO)

FROG POND

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: MILLERS MINE **PA#:** 20-176

Date: July 7, 1994 **Time:** 0900-1500

Field Team Leader: Tuesday, Pioneer

Sampling Personnel: Belanger, West; Pioneer

Visitors: None

Weather/Seasonality Observations: Partly cloudy; warm; rain on previous day.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): Shaft located on WR-1, GW-1 sample location; #18: Headframe and boiler on WR-1; #19: Caved adit with discharge, AD-1 sample location; #20: WR-1 from lower road facing south; #21, #22: WR-1 from southwest; #23: WR-2 from southeast; #24: Submerged shaft in bog, GW-2 sample location; #25: Small waste rock pile and bog shaft; #26: SW-1 sample location at culvert below bog. Video Tape No. 2

General Comments/Observations (not covered specifically in attached Inventory Forms): Large dumps with abundant sulfides and low pH in headwaters. Some natural treatment provided by bogs downstream.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Several bogs and marshes exist downstream of site and may be used as a natural "cleanser". Waste rock should be recontoured and revegetated with possible amendments being needed.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): MILLERS MINE **PA#:** 20-176

Legal Description: **T** 3N ;**R** 17W ;**Sec.** 11 , NE **1/4** NW **1/4** ____ **1/4**

County: GRANITE **Mining District:** FROG POND

Latitude: N 46° 01' 49" **Longitude:** W 113° 40' 50"

Primary Drainage Basin and Code: Copper Creek/17010202
Secondary Drainage Basin: Lutz Creek

USGS Quadrangle map name(s): Whetstone Ridge

Mine Type/Commodities: Hardrock/Gold, Silver, Copper, Lead, Zinc

Activity Status: **Active** ___, **Inactive/Exploration** ___, **Abandoned** X .

Ownership: Known Y ___ **N** X ; **private/public?** Private
Owner, Agent, or Contact **(Include address and phone when available):** Unknown

Relationship to other mines/sites in the area/district: Unknown

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? N/A

General site features: Elevation 7400' , **Slope** 10° ,
Aspect Southeast

Land use: Mining X , **Recreational** X , **Residential** ___, **Urban** ___,
Agricultural ___, **Other(Specify)** ___

Area of disturbed/unvegetated lands? Approx. 1 **acre(s).**
Site Dimensions: 200 feet x 250 feet

Predominant vegetation types: Lodgepole pine/spruce forest, wetland, grasses

Access: roads - good (paved) ___, **poor (maintained dirt road)** ___,
4wd X , **trail** X .
Other logistical considerations (proximity to other sites). Near the Montana Prince Mine

Well logs within 1 mile radius; **(Attach MBMG Well Log Printout(s)):** There are no wells reported within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Miller Mine is on the northwest side of Frog Pond Basin in an unnamed tributary of Lutz Creek; The tributary joins Lutz Creek one mile downstream. Lutz Creek joins Copper Creek four miles downstream; Copper Creek joins the Middle Fork of Rock Creek five and one-half miles from the intersection with Lutz Creek. Site is underlain by quartz monzonite. Shallow groundwater due to resistant rock forming perched Frog Pond Basin (many bogs or swamps and poorly drained).

Mining/milling history, ore type/tenor, host rock, gangue: There were 1,269 tons of ore shipped during 1929 to 1937; 80 tons of dump shipped in 1968. Total production was 817 oz. gold, 4,145 oz. silver, 2,177 lbs. copper, 76,436 lbs. lead, and 22,392 lbs. zinc. Fissure filled, quartz-sulfide veins along shear zones in quartz monzonite host rock. Tenor was 0.6 oz/ton gold, 3 oz. from silver in vein up to 9 feet thick.

Mine Operation?

Shafts - **Yes** X, **No** ___, **#** 4, **Comment** 1 caved; 1 covered with wood (water at 25'); 2 submerged

Adits - **Yes** X, **No** ___, **#** 1, **Comment** Caved, discharging

Pits - **Yes** ___, **No** X, **#** ___, **Comment**

Placers - **Yes** ___, **No** X, **#** ___, **Comment**

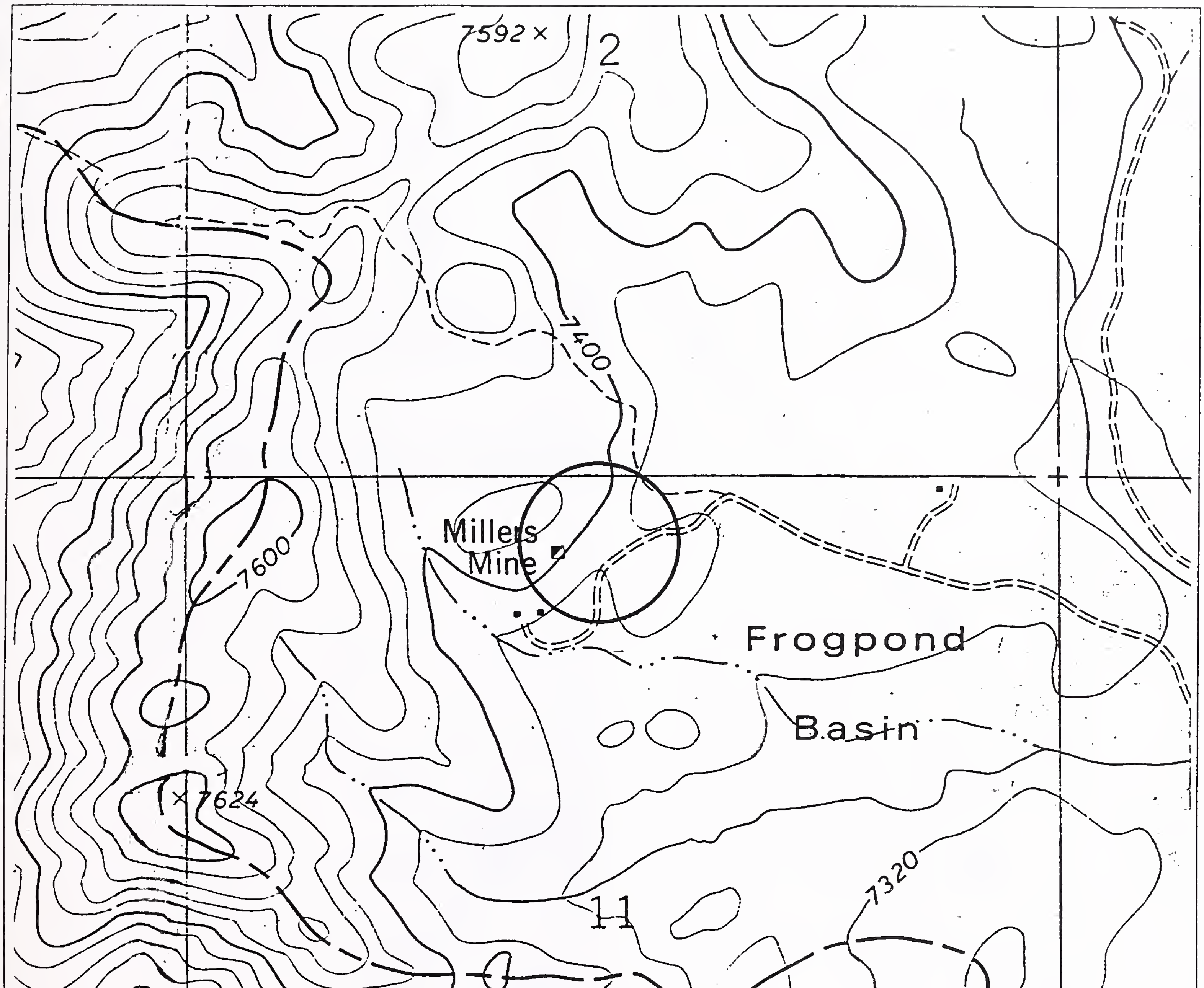
Other - **Yes** ___, **No** X, **#** ___, **Comment**

Mill Operation? **Yes** ___, **No** X. **If yes answer the next three questions:**

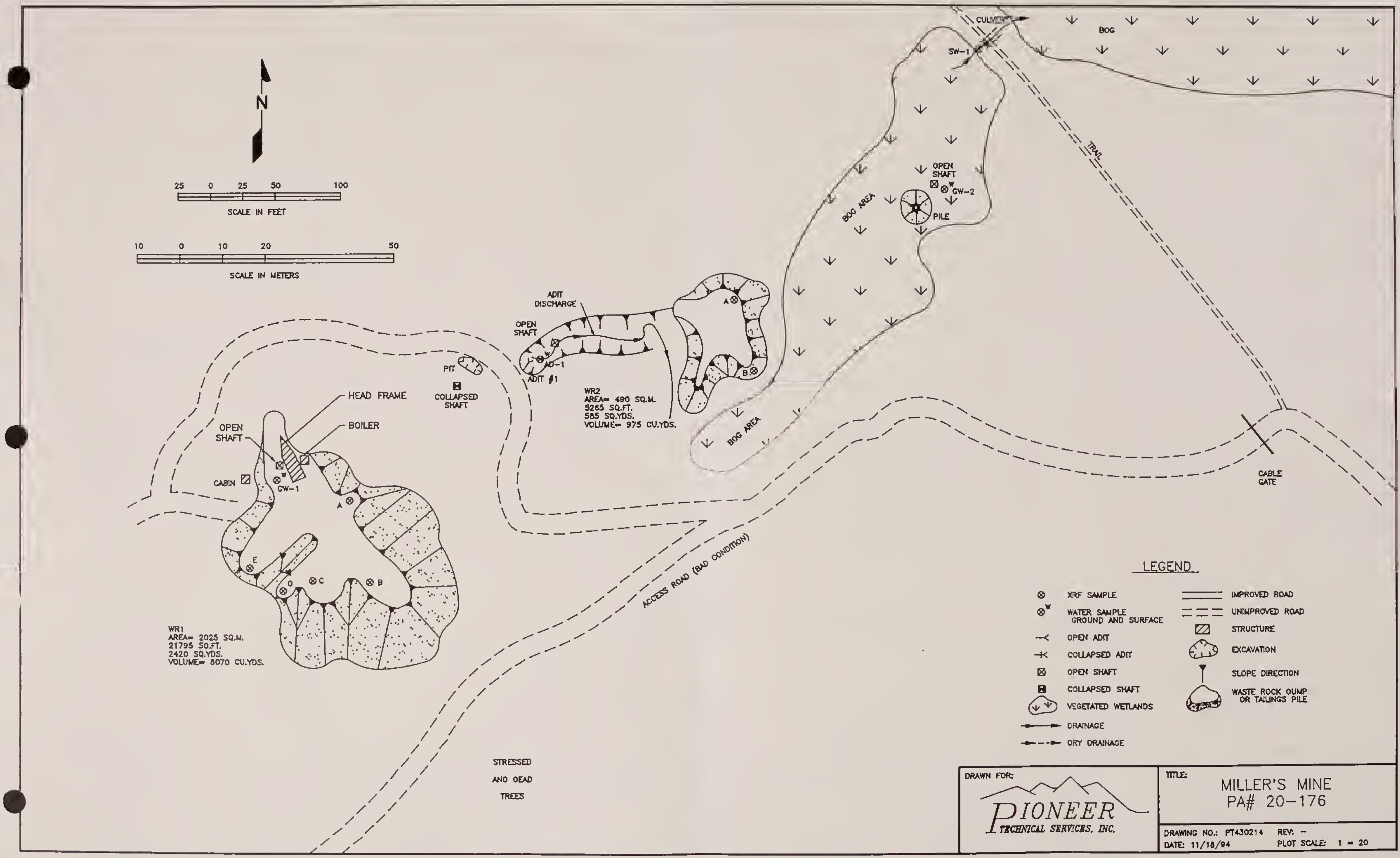
Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill___ Dedicated Mill___; Number and names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN^- leach (vat, heap), floatation, smelting?
N/A



MILLERS MINE, P.A. NO. 20-176
T03N, R17W, SECTION 11
SCALE: 1" = 1000'



DRAWN FOR:

PIONEER
TECHNICAL SERVICES, INC.

TITLE:

MILLER'S MINE
PA# 20-176

DRAWING NO.: PT430214 REV: –
DATE: 11/18/94 PLOT SCALE: 1 = 20

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. **Waste Characteristics** - *Use table on following page.*

Unique source identification: (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures/vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. **TAILINGS IMPOUNDMENTS** - *If tailings impoundments are also present, complete the following questions.*

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: West

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1A	WR	8,070	Large upper dump with shaft; east lobe	None	> 3.5 (D)	0.06	20-176-WR-1	07/07/94 1320	T-Metals, ABA
WR-1B	WR		Southeast lobe	None	6.2 (D)	0.06			
WR-1C	WR		South lobe	None	3.5 (D)	0.09			
WR-1D	WR		Southwest lobe	None	> 3.5 (D)	0.11			
WR-1E	WR		West lobe	None	5.2 (D)	0.12			
WR-2A	WR	975	Small lower dump with adit; east lobe	None	4.2 (D)	0.04	20-176-WR-2	07/07/94 1330	T-Metals, ABA
WR-2B	WR		South lobe	None	> 3.5 (D)	0.05			

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 20-176-WR-1 is composite of WR-1A through -1E. 20-176-WR-2 is composite of WR-2A and -2B.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X , No___, **Number:** 1 **Identification:** AD-1

Filled shafts: Yes X , No___, **Number:** 2 **Identification:** GW-1 and GW-2

Seeps/Springs: Yes___, No X , **Number:**___ **Identification:**___

Groundwater wells within 4 miles?: Yes___, No X ;
Number of well logs: 0

Distance to nearest well used for drinking:
___<1,000 ft;___1,000 ft to 0.5 miles; X >0.5 miles.

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite___, **Probable** X , **Possible**___, **Unlikely**___.
Very shallow groundwater; uncontained dumps with free sulfides, low pH, and high metals concentrations.

Approximate Depth to Groundwater: X <25 ft;___ 25 - 100 ft;___ >100 ft.

Other observations/notes: There are large swamps below the site. (Note: The site was revisited in September of 1994 to take additional photographs. The swamps were found to be dry and much less water existed at the site.)

GROUNDWATER INVENTORY FORM

SAMPLERS: Tuesday, Belanger

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
AD-1	AD	Discharge from collapsed adit; collected where emanates from ground	3 gpm (E)	7.36	129	N/A	6.2	68	N/A	20-176-AD-1	07/07/94 1030	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
GW-1	SH	Upper shaft at WR-1	N/A	7.38	98	240.4	7.0	39	30	20-176-GW-1	07/07/94 1120	D-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
GW-2	SH	Lower shaft in bog (flooded)	N/A	7.07	53	229.7	10.2	19	0	20-176-GW-2	07/07/94 1220	D-Metals, TDS, Hardness, Cl, SO4, NO2/NO3

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No ___, **Name(s):** Unnamed western tributary of Lutz Creek

Dry streambeds: Yes ___, No X, **Name(s):** ___

Other surface water: Yes X, No ___, **Name(s)/Description:** Large semi-flooded bogs or swamps below mine

Waste materials within any floodplain: Yes X, No ___ **Source ID(s):** WR-2 is in bog.

Approximate Flood frequency? X 1 yr, ___ 10 yr, ___ 100 yr

Estimated seasonal flow of stream(s) (cfs/gpm)? 5 gpm
High Flow: 20 gpm, **Average Flow:** 5 gpm

Distance between waste source(s) and nearest surface water body (ft)? 0 feet from WR-2 to bog

Surface water draining onto or through waste sources: Yes X, No ___,
Describe: Adit discharges onto WR-2 and disappears.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Recreational and possible irrigational uses on Lutz Creek. Copper Creek has recreation, fishery, and irrigation uses.

Observed erosional/sedimentation/stream turbidity problems? Yes ___, No X. **Distance downstream (ft)?** 0-500 ___; 500-1,000 ___; >1,000 ___.
Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): ___

SURFACE WATER INVENTORY FORM

SAMPLERS: Tuesday

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC $\mu S/cm$ @ 25°C	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	Below bog where culvert runs under trail	7.79	52	16.1	23	8 gpm (E)	20-176-SW-1	07/07/94 1300	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ______

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides? *(SO_3)*

Presence of evaporative salt deposits? *(ESD)*

Discolored or turbid seepage? *(SPG)*

Presence of long filamentous algae in drainages, mosses in moist areas?

Presence of ferric hydroxide precipitates? *(FEOX)*

Presence of burned or stressed vegetation? *(VEG)*

pH ≤ 5.0 *(pH)*

General Potential for AMD Mitigation:

Area available for treatment (acres)? 5 acres

Wetlands present: Yes X **, No** ___ **, Describe:** Bogs below mine (2 and 5 acres)

Carbonate rocks/soils: Yes ___ **, No** X **, Describe:** ___

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 X **; 10-30** ___ **; 30-100** ___ **; 100-300** ___ **; 300-1,000** ___ **; 1,000-3,000** ___ **; 3,000-10,000** ___ **; 10,000 or greater** ___ **; Comments** ___

Nearest residence: ___ **<1,000 ft;** ___ **1,000 ft - 0.5 miles;** X **>0.5 miles.**

For each source (table next page):

Available fine materials? *Surface area?*

Uncovered and unvegetated? *Wet or dry?*

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Tuesday, Belanger, West

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
WR-1	SO3; FEOX; pH	Dry	21,795	21,795	Yes	Moderate
WR-2	SO3; FEOX; pH	Dry	5,265	5,265	Yes	Low
AD-1	FEOX	N/A	N/A	N/A	N/A	N/A

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No X.
Describe:__________

Population within 1 mile: 1-10 X; 10-30___; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments Appears to be summer residences; hunting cabins

Evidence of recreational use on site: Yes X, No___, Describe: Litter; camping nearby; unlocked cable gate

Accessibility (check each that apply): X Easily accessible - no fences, gates, or warning signs; ___ Moderately Accessible - barbed wire fences, road gated, or signs posted; ___ Difficult Access - chain-link fence, road gated and locked, site guarded (does not include locked or manned access points located more than 0.5 miles from the actual site).

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No X, Comment__________
Wilderness Area - Yes___, No X, Comment__________
T&E Species Habitat - Yes X, No___, Comment Peregrine Falcon
Bat Habitat - Yes___, No X, Comment__________

Primary Drainage X; Secondary Drainage___; No Information___:

- Riparian Habitat Quality - High___, Medium X, Low___
- Wetlands Frontage - High X, Medium___, Low___
- Fisheries Habitat and Species Classification - 4
- Sport Fishery Classification - 4

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No___, Number 3, types and locations: One in bog (GW-2); one in collapsed adit; one at shaft at WR-1 (GW-1).

Hazardous structures: Yes X, No___, Number 3, types and locations: Headframe and two cabins

Unstable highwalls, pits, trenches, slopes: Yes___, No X, Number____, types and locations:__________

Unstable waste piles, impoundments, undercut banks: Yes____, No X, Number____, types and locations:__________

Fire and/or Explosion hazards: Yes___, No X, Explain:__________

Bibliography

MBMG, Well Log Database, July 14, 1994.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Millers Mine, Prepared by Northern Engineering and Testing, August 29, 1988.

USBM, Summary Report Mineral Investigation of the Sapphires Rare II Area (No. 1421), Granite and Ravalli Counties, Montana, Prepared by D'Arcy Banister, Terry J. Close, Robin B. McCulloch, Ronald T. Mayerle, and Sally Shoop, 1983.

USGS, Topographic Map, Whetstone Ridge, Montana, 7 1/2 minute Quadrangle, 1974.

LABORATORY ANALYTICAL DATA

MILLERS MINE
PA NO. 20-176

Millers Mine PA# 20-176
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 07/07/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-176-WR1	6.1	68.6 J	179	17.1 J	18.3	6.1 J	473 J	15400	1.73 J	495	4.6 JX	1980	6.8 JX	2570	NR
20-176-WR2	15.7	92.3 J	34.1	29.5 J	1.5 U	1.9 J	274 J	12700	0.78 J	61.0	1.4 UJX	4020	5.2 UJX	2020	NR
BACKGROUND	NR	11 J	267	1.7	11.0	8.7	7.8	12800	0.08 JX	250	9.0	15	5.0 UJ	62	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
20-176-WR1	0.66	21.6	1.85	-19	0.55	0.02	0.09	0.62	1.23
20-176-WR2	0.31	9.68	-1.60	-11	0.23	0.02	0.06	0.62	-2.23

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
20-176-AD1	0.12 U	5.7	26.1	4.6	8.7 U	4.7 U	4.6 U	1230	0.11 U	578	8.0 U	16.0 J	29.4 UX	183 JX	56.1
20-176-GW1	0.12 U	1.7 U	16.3	28.9	8.7 U	4.7 U	17.3	60.5	0.11 U	117	8.0 U	39.7	29.4 U	1060	40.5
20-176-GW2	0.12 U	1.7 U	24.8	2.8	8.7 U	4.7 U	4.6 U	336	0.11 U	136	8.8	1.3 U	29.4 U	21.4	21.7
20-176-SW1	0.12 U	1.1 U	22.1	7.4	8.7 U	4.7 U	17.4	97.8	0.11 U	12.6	8.0 U	0.4 U	29.4 UX	471 JX	21.7

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
20-176-AD1	75	<5.0	5.0	0.10	NR
20-176-GW1	70	<5.0	12	0.07	NR
20-176-GW2	15	<5.0	5.0	0.05	NR
20-176-SW1	44	<5.0	7.0	<0.05	NR

LEGEND

WR1 - Composite of subsamples WR1A through 1E.
WR2 - Composite of subsamples WR2A and 2B.
BACKGROUND - From the Montana Prince Mine (41-004-SS1) (1993 Data).

AD1 - Discharge from collapsed adit; collected where emanates from ground.
GW1 - Upper shaft at WR1.
GW2 - Lower shaft in bog (flooded).
SW1 - Below bog where culvert runs under trail.

XRF ANALYSIS RESULTS

MILLERS MINE
PA NO. 20-176

Mine Name: Millers Mine PA# 20-176
XRF Field Analyses
Results In PPM

XRF SAMPLE I.D.	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Ni	Cu	Zn	As	Sr
20-176-WR1A		34908.4	1439.25	818.08			16165.7			459.329	941.317		
20-176-WR1B		16401.6	8775.64	857.083		596.619 *	15335.2			1377.11	5146.51		192.233
20-176-WR1C		28872.6	1301.47	789.476			17429.5			145.813 *	604.542		14.974 *
20-176-WR1D		21133.9	2382.88	643.94 *			22214.3			204.737 *	1515.07		29.5137 *
20-176-WR1E		20184.2	1185.66	647.987			19124.4			209.51 *	254.847		
20-176-WR1-COMP		26388.3	4385.32	1109.66			18102.9			567.18	1961.3		64.6459
20-176-WR2A		28434	2914.09	778.163			16017.9			193.474 *	1145.24		39.1118 *
20-176-WR2B		36791.8	1647.69	1032.62			18185.3			334.078	2006.45		16.7505 *
20-176-WR2-COMP		33324.2	2468.29	872.424			17427.1			237.326 *	1242.28		33.1614 *

XRF SAMPLE I.D.	Zr	Hg	Mo	Pb	Rb	Cd	Sn	Sb	Ba	Ag	U	Th
20-176-WR1A	112.968	63.8556 *		4138.16	261.82				122.603			
20-176-WR1B	91.788				121.699				425.924		31.7272 *	
20-176-WR1C	85.9691			4232.37	219.807				131.691			
20-176-WR1D	74.4902			2350.69	209.488				156.728			21.5102 *
20-176-WR1E	44.5102	59.546 *		2386.73	121.986				55.0476 *			
20-176-WR1-COMP	97.1353			2125.93	208.019				249.988			25.482 *
20-176-WR2A	75.9436			2337.32	173.594				164.236			19.6296 *
20-176-WR2B	122.476			2693.01	255.75				281.6			
20-176-WR2-COMP	90.3787			2266.37	238.061				271.754			

* = Estimated Quantity

$ = Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

MILLERS MINE
PA NO. 20-176

AIMSS SCORESHEET

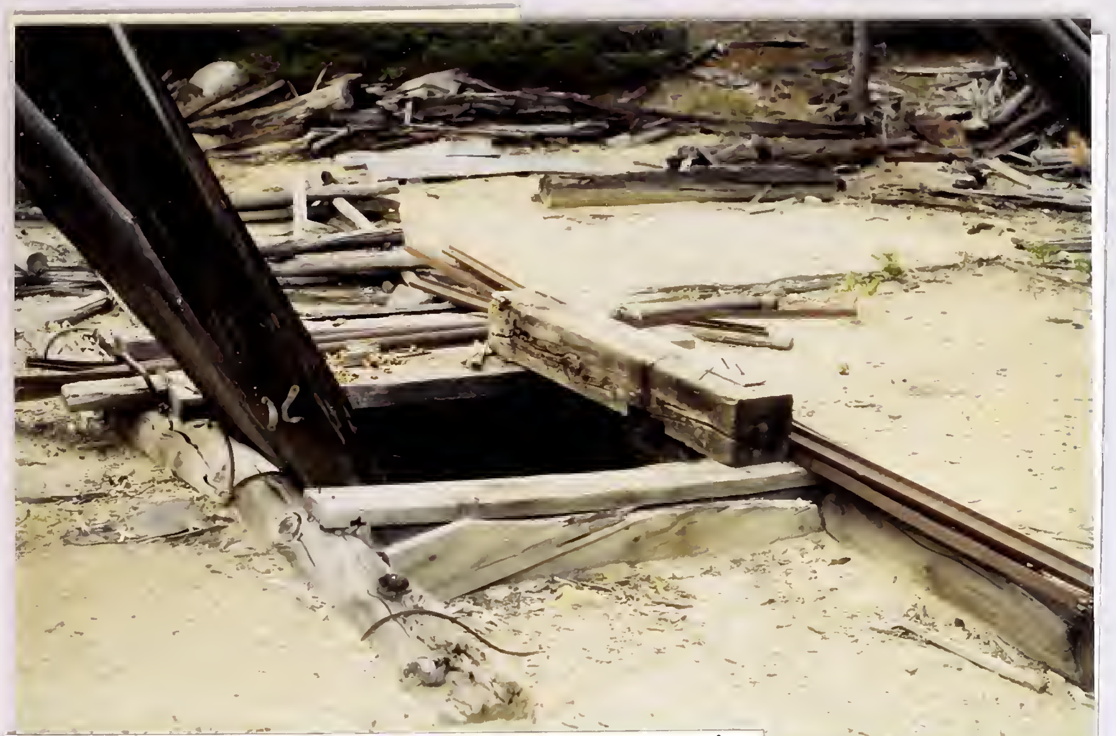
SITE NAME: Millers Mine
PA NUMBER: 20-176

LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		100
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	500
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	7.628
6	GW - TARGETS	WELLS - 1 MI. x 2.5		0.0
7		WELLS - 1 TO 4 MI		0
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	0.0
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	0
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
12		EXCEEDENCES		100
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	500
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	8.406
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19		FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		5
23		TARGETS SCORE	SUM LINES 16 THRU 22	23
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	96669
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.271
29	AIR - TARGETS	POPULATION - 4 MILES		1
30		NEAREST RESIDENCE		0
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		5
34		TARGETS SCORE	SUM LINES 29 THRU 33	16
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	217
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		50
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	150
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.246
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		1
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		5
43		TARGETS SCORE	SUM LINES 40 THRU 42	6
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	221
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE (LINES 10 + 24 + 35 + 44) / 100,000			0.97

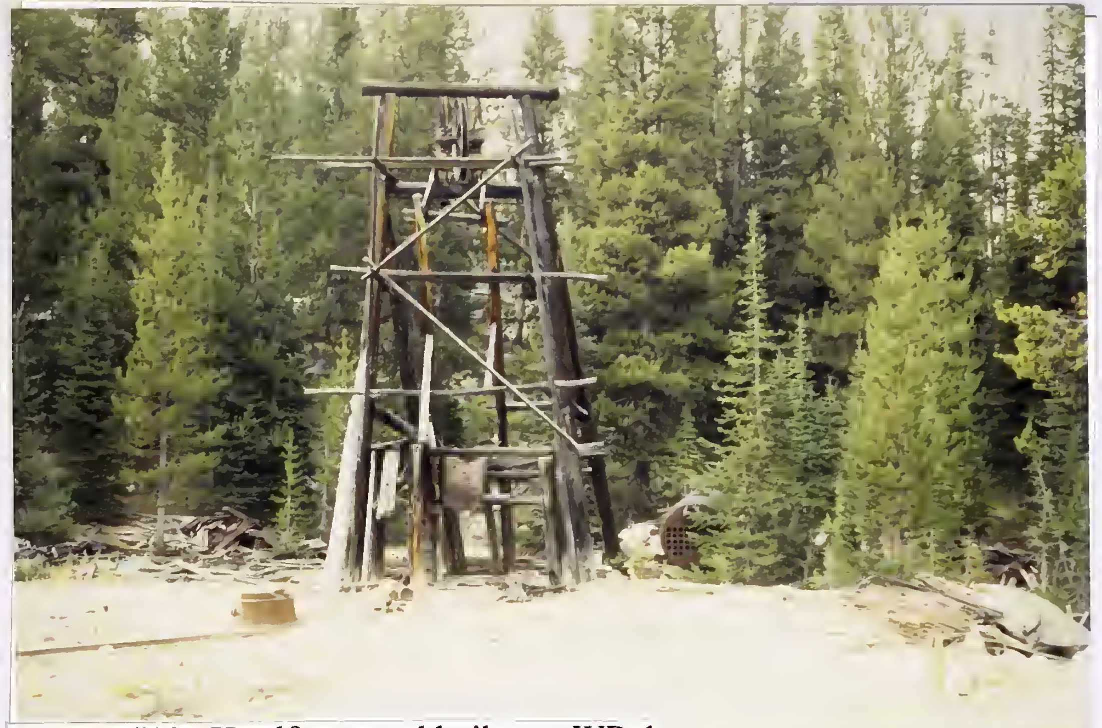
SITE NAME: Millers Mine
PA NUMBER: 20-176

SITE SAFETY

LINE NO.				
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	300
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	120
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	420
9		POPULATION - 1 MILE		1
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		5
12		TARGETS SCORE	SUM LINES 9 THRU 11	6
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	50.40

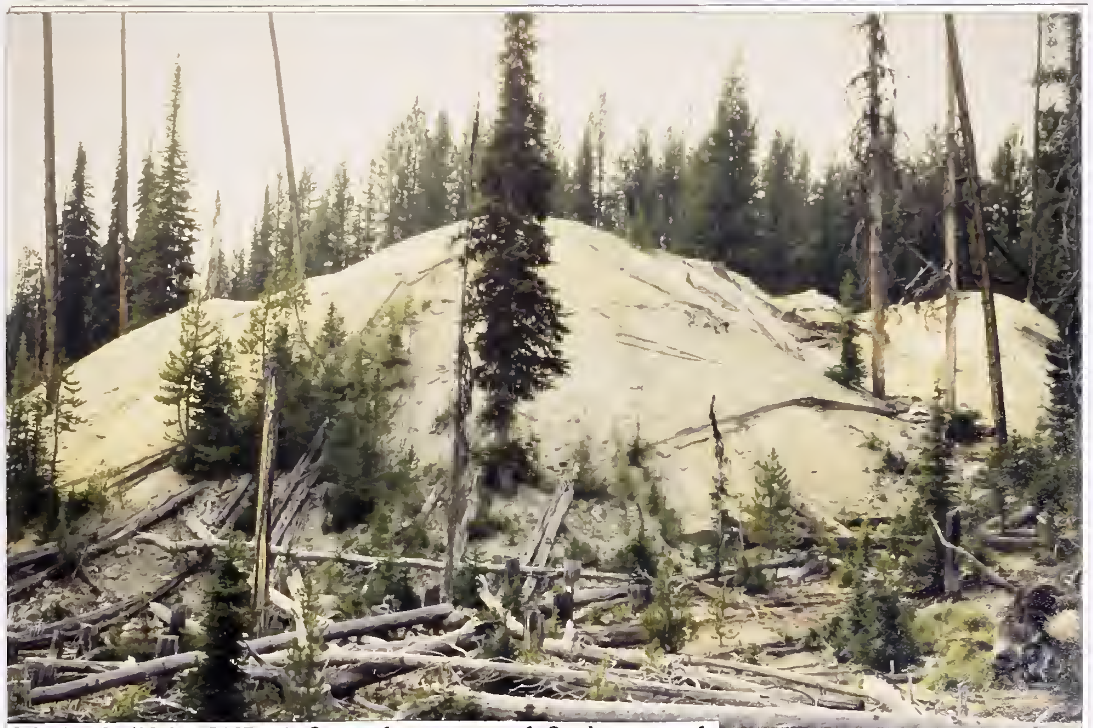


20-176, #17: Shaft on WR-1; GW-1 sample location



20-176, #18: Headframe and boiler on WR-1

20-176, #19: Caved Adit #1 with discharge



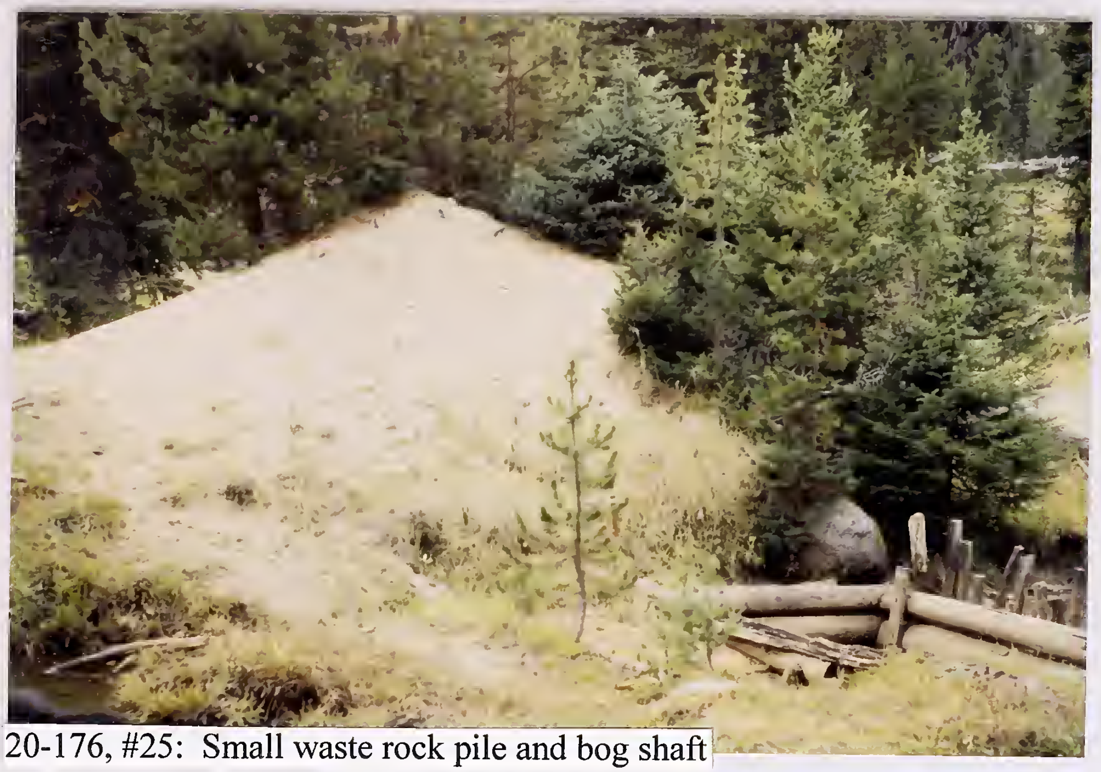
20-176, #20: WR-1 from lower road facing south

20-176, #21: WR-1 from southwest

20-176, #22: WR-2 from southwest

20-176, #23: WR-2 from southeast

20-176, #24: Submerged shaft in bog; GW-2 sample location



20-176, #25: Small waste rock pile and bog shaft

20-176, #26: SW-1 sample location

GARNET

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: FREE COIN/RED CLOUD **PA#:** 20-134

Date: June 29, 1994 **Time:** 0910-1630

Field Team Leader: Bisch, Pioneer

Sampling Personnel: Flammang, Clark, West; Pioneer

Visitors: Two recreational visitors to look at the mill building.

Weather/Seasonality Observations: Sunny and warm (70° to 80°F); southeast breeze; windy during afternoon.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #11: Adit #4 (HMO); #12: WR-4; #13: Adit #2 (HMO); #14: Adit #5 (HMO); #15: Mill building and lined upper pond; #16, #17: WR-1; #18: Adit #1 discharge; #19: WR-6; #20: WR-8; #21: SW-2 sample location. Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms): An additional mine site is located approximately 1,000 feet southeast of Free Coin/Red Cloud Mill. The mine is not indicated on previous inventory form. The site consists of several waste rock dumps and at least one HMO. Sign on the road to the site reads, "No Trespassing, Property of Armada Corporation, (702) 737-0586." There are three ponds located on the Free Coin/Red Cloud site. Upgradient, lined pond is part of diversion structure used to divert flow from First Chance Gulch below the site (WR-1 and WR-2). Two additional ponds are located downgradient. Flow seeps from WR-2 and into the first pond (pond constructed by dam); flow then goes subsurface and reappears below the dam before flowing into another constructed pond. Flow goes subsurface again and reappears in First Chance Gulch downstream. Below lower settling ponds, First Chance Gulch was heavily placered in the past. Large placer piles are 80% revegetated. The stream is still walled in several areas 1,000 feet below the last pond.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Isolate dump material from drainages, recontour, and vegetate. Close HMOs.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): FREE COIN/RED CLOUD **PA#:** 20-134

Legal Description: **T** 12N **;R** 14W **;Sec.** 3 **,** SW **1/4** SE **1/4** ____ **1/4**

County: GRANITE **Mining District:** GARNET

Latitude: N 46° 49' 12" **Longitude:** W 113° 20' 44"

Primary Drainage Basin and Code: Bear Creek/17010201
Secondary Drainage Basin: First Chance Gulch

USGS Quadrangle map name(s): Elevation Mountain

Mine Type/Commodities: Hardrock, Millsite/Gold

Activity Status: **Active** ___, **Inactive/Exploration** ___, **Abandoned** X .

Ownership: Known Y ___ **N** X ; **private/public?** Private
Owner, Agent, or Contact (Include address and phone when available) **:** Unknown

Relationship to other mines/sites in the area/district: Unknown

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? N/A

General site features: Elevation 5560'-5740', **Slope** 35° ,
Aspect Southeast, southwest, northwest

Land use: Mining ___, **Recreational** X , **Residential** ___, **Urban** ___,
Agricultural ___, **Other(Specify)** ___

Area of disturbed/unvegetated lands? 18 **acre(s).**
Site Dimensions: 1,000 feet x 800 feet

Predominant vegetation types: Douglas fir, Lodgepole pine, alder

Access: roads - good (paved) ___, **poor (maintained dirt road)** X ,
4wd ___, **trail** ___.
Other logistical considerations (proximity to other sites). Site is located approximately 0.5 miles down the road from Garnet.

Well logs within 1 mile radius; **(Attach MBMG Well Log Printout(s):** There are no wells reported within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings **(Also note presence of radioactive minerals).** Country rock consists of quartzite and schist. Site lies on both sides of First Chance Gulch which flows southwest through and under the site. First Chance Gulch flows into Bear Creek approximately one mile southwest of the site. Bear Creek flows into the Clark Fork River.

Mining/milling history, ore type/tenor, host rock, gangue: The First Chance Mining Company operated a 10-stamp mill in First Chance Gulch close to the mouth of the Red Cloud incline. Red Cloud vein was located in 1867. The vein filling normally consists of quartz with varying amounts of irregularly distributed barite, ankerite, and the ore minerals pyrite, chalcopyrite, tetrahedrite and galena.

Mine Operation?

Shafts - **Yes** X, **No** ___, **#** 1, **Comment** Caved

Adits - **Yes** X, **No** ___, **#** 10, **Comment** 5 open; 5 collapsed; 1 discharging

Pits - **Yes** X, **No** ___, **#** 1, **Comment** 30' highwall

Placers - **Yes** ___, **No** X, **#** ___, **Comment** ___

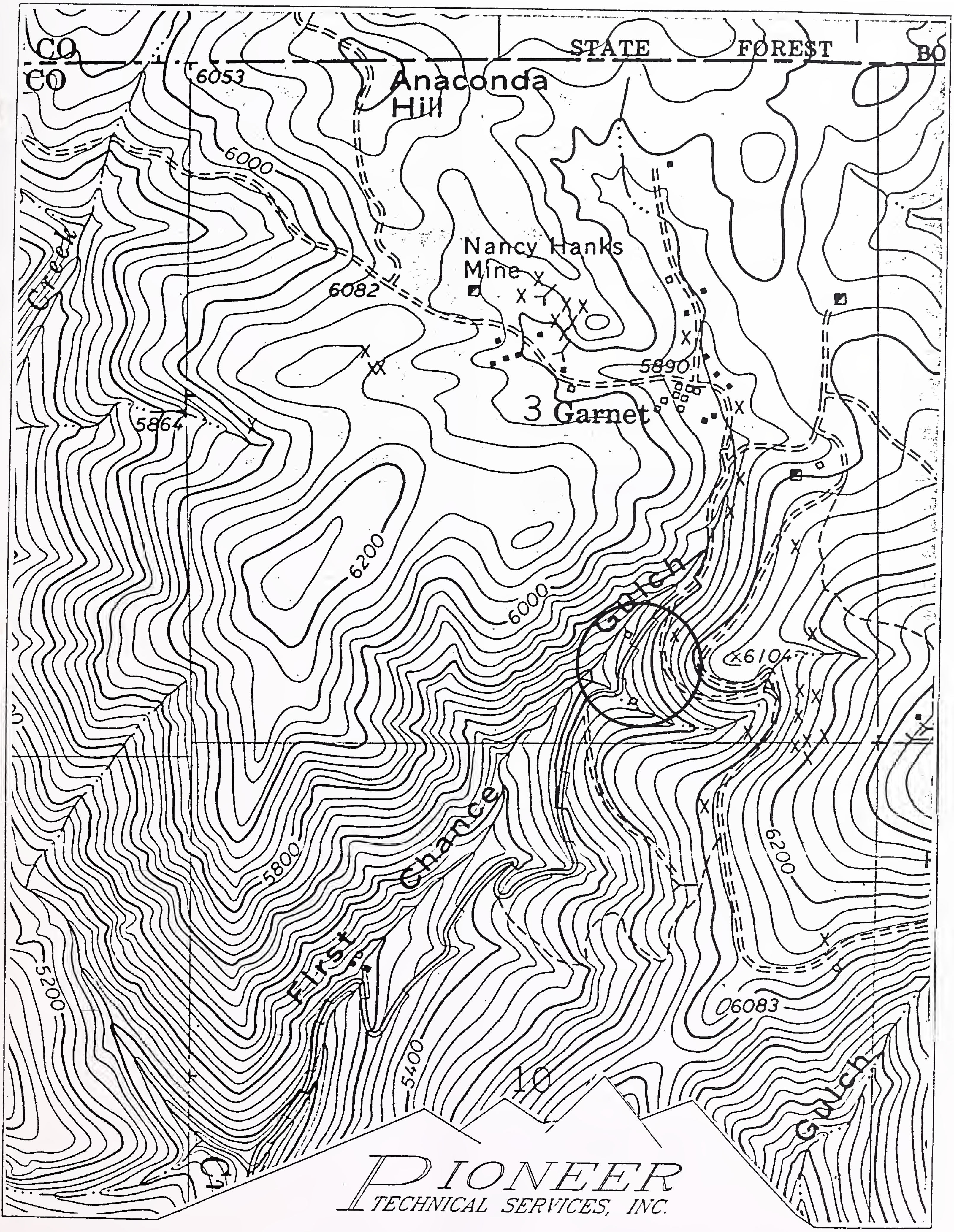
Other - **Yes** ___, **No** X, **#** ___, **Comment** ___

Mill Operation? **Yes** X, **No** ___. **If yes answer the next three questions:**

Period(s) of Operation: Unknown

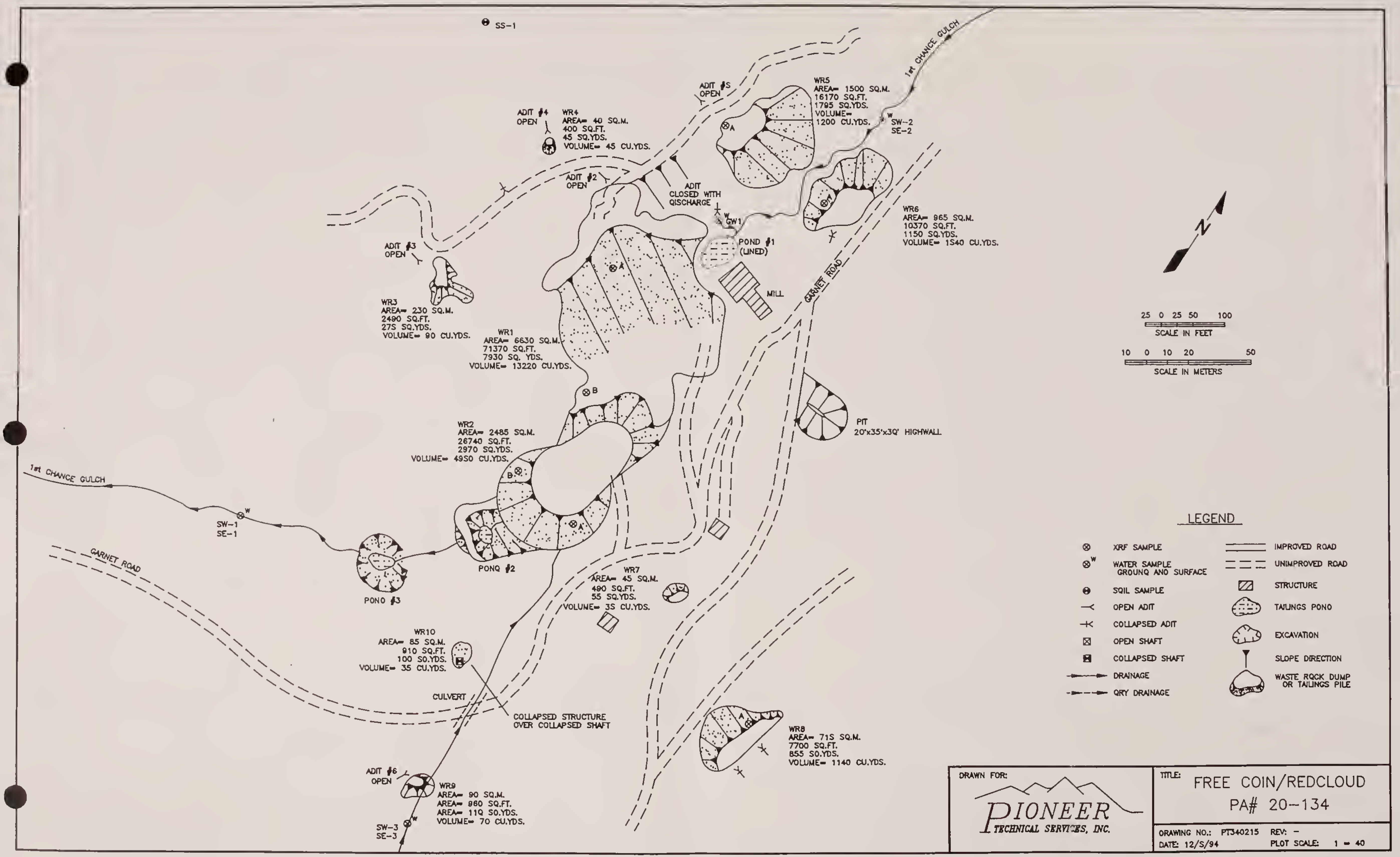
Origin of Ore Milled - Custom Mill ___ **Dedicated Mill** X; **Number and names of mines that supplied mill feed:** The mill, though not a custom mill, treated ores for other operators in the district.

Process? Hg-amalgam, CN$^-$ leach (vat, heap), floatation, smelting?
Both amalgamation and cyanidation were listed as processes in 1925.



PIONEER TECHNICAL SERVICES, INC.

FREE COIN/RED CLOUD, P.A. NO. 20-134
T12N, R14W, SECTION 03
SCALE: 1" = 1000'



DRAWN FOR:

PIONEER
TECHNICAL SERVICES, INC.

TITLE: FREE COIN/REDCLOUD
PA# 20-134

DRAWING NO.: PT340215 REV: -
DATE: 12/5/94 PLOT SCALE: 1 = 40

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. **Waste Characteristics** - *Use table on following page.*

Unique source identification: (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures/vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. **TAILINGS IMPOUNDMENTS** - *If tailings impoundments are also present, complete the following questions.*

Describe the tailings grain size distribution (approximate % sand, silt, & clay): Light orange to orange silt/sand

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): Tailings were noted in three locations - one small pile next to the mill; in a cut bank as lenses beneath 0-4" of organics and topsoil; and possible tailings pushed up in WR-2. No impoundments; no stratification.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Dry

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): None

Comments on potential for mitigation: Appears that tailings were dumped on the ground and washed down the valley. There may be more tailings under waste rock, but could not determine. The spotty nature and small amount of tailings identified limit mitigation requirements.

SOURCE INVENTORY FORM

SAMPLERS: Bisch, Flammang, West

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1A	WR	13,220	Coarse brown sand located at center of summit of WR-1	None	6.0 (D)	0.035	20-134-WR-1	06/29/94 1545	T-Metals, ABA
WR-1B	WR		Coarse dark gray sand on the southwest lobe of WR-1	None	5.8 (D)	0.06			
WR-2A	WR	4,950	Southeast face of WR-2, 5' from the top	None	7.0 (D)	0.05			
WR-2B	WR		Southwest end of WR-2 on north facing slope where material has been moved around	None	7.2 (D)	0.05			
WR-3	WR	90	Above southwest end of WR-1	None	NM	NM	N/A	N/A	Not Sampled
WR-4	WR	45	Above northeast end of WR-1	None	NM	NM	N/A	N/A	Not Sampled
WR-5	WR	1,200	Large dump associated with Adit #5; on top of south end	None	6.9 (D)	0.05	20-134-WR-5	06/29/94 1050	T-Metals, ABA
WR-6	WR	1,540	West face of WR-6; near middle on south end	None	6.5 (D)	0.025			
WR-7	WR	35	Waste rock across road and southeast of mill building	None	NM	NM	N/A	N/A	Not Sampled
WR-8	WR	1,140	West face of WR-8; near top of north end	None	7.1 (D)	0.04			
WR-9	WR	70	Small pile in southeast drainage; in middle, near top	None	6.4 (D)	0.045			
WR-10	WR	35	Waste rock northwest of WR-9	None	NM	NM	N/A	N/A	Not Sampled
TP-1A	TAIL	5	Yellow fines near mill building	None	5.6 (D)	0.06	N/A	N/A	XRF Analysis
TP-2A	TAIL	ND	Yellow fines in eroded layer along tree line (thin lens)	None	6.0 (D)	0.04	N/A	N/A	XRF Analysis
TP-2B-A	TAIL	ND	Composite of 3 holes from small depression on southeast side of WR-2	None	6.45 (D)	0.04	N/A	N/A	XRF Analysis
TP-2B-B	TAIL		Composite of 2 holes on southeast side of WR-2	None	6.8 (D)	0.04	N/A	N/A	XRF Analysis
SS-1	SOIL	N/A	Background soil approx. 150' west of Adit #4	N/A	N/A	0.03	20-134-SS-1	06/29/94 1610	T-Metals

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 20-134-WR-1 is composite of WR-1A and -1B, and WR-2A and -2B. 20-134-WR-5 is grab of WR-5. ND = Not Determined; NM = Not Measured. Only minor quantities of tailings were found at the site; tailings may be covered by dump material.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes_X_, No___, Number:_1_ Identification:_Adit #1_

Filled shafts: Yes___, No_X_, Number:___ Identification:___

Seeps/Springs: Yes___, No_X_, Number:___ Identification:___

Groundwater wells within 4 miles?: Yes_X_, No___;
Number of well logs:_6_

Distance to nearest well used for drinking:
___<1,000 ft;___1,000 ft to 0.5 miles;_X_>0.5 miles.

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite___, **Probable**___, **Possible**_X_, **Unlikely**___.
Large, uncontained waste rock sources with elevated metal values; discharging adit and stream flowing subsurface may be in contact with them.

Approximate Depth to Groundwater:_X_<25 ft;___ 25 - 100 ft;___ >100 ft.

Other observations/notes:_N/A_

GROUNDWATER INVENTORY FORM

SAMPLERS: Bisch

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
GW-1	AD	Discharge associated with Adit #1; discharge flows 25' over dump material and discharges into First Chance Gulch	6 gpm (E)	7.12	621	-14.7	13.1	13.5	N/A	20-134-GW-1	06/29/94 1330	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3

*FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: **Yes** X, **No** ____, **Name(s):** First Chance Gulch and unnamed tributary to First Chance Gulch

Dry streambeds: **Yes** ____, **No** X, **Name(s):** ____

Other surface water: **Yes** X, **No** ____, **Name(s)/Description:** Ponded water in lined pond at base of north end of WR-1; two ponds present below WR-2.

Waste materials within any floodplain: **Yes** X, **No** ____ **Source ID(s):** WR-1, WR-2, WR-5, WR-6, and WR-9

Approximate Flood frequency? X **1 yr,** ___ **10 yr,** ___ **100 yr**

Estimated seasonal flow of stream(s) (cfs/gpm)? 0.73 cfs
High Flow: 3.75 cfs, **Average Flow:** 0.75 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: **Yes** X, **No** ____, **Describe:** First Chance Gulch flows beneath WR-1 and WR-2. Toes of WR-5 and WR-6 are in First Chance Gulch. Unnamed tributary flows under WR-9 and at toe of WR-10, then disappears into WR-2. It appears that waste rock from WR-2 was used for the first of the lower settling ponds.

Surface water use within 15 miles downstream? **(Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)** Clark Fork River has irrigation, agriculture, fishery, and recreation.

Observed erosional/sedimentation/stream turbidity problems? **Yes** X, **No** ____. **Distance downstream (ft)? 0-500** ___; **500-1,000** X; **>1,000** ___. **Describe/explain** **(Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):** Only fine-grained material is present in the stream; no cobbles until approximately 750 feet. Material appears similar to fines (TP-2B-A and -2B-B) on WR-2.

SURFACE WATER INVENTORY FORM

SAMPLERS: Bisch, Flammang

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC $\mu S/cm$ @ 25°C	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	Downstream 50' of last settling pond in First Chance Gulch	6.25	433	16.1	101	0.73 cfs (M)	20-134-SW-1	06/29/94 1300	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-1	SE	Downstream 50' of last settling pond in First Chance Gulch	N/A	N/A	N/A	N/A	N/A	20-134-SE-1	06/29/94 1300	T-Metals
SW-2	SW	Upstream in First Chance Gulch	8.29	342	14.9	13.6	0.73 cfs (M)	20-134-SW-2	06/29/94 1345	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-2	SE	Upstream in First Chance Gulch	N/A	N/A	N/A	N/A	N/A	20-134-SE-2	06/29/94 1345	T-Metals
SW-3	SW	Upgradient of WR-9 in southeast side of unnamed tributary	7.52	359	15.2	17	5 gpm (E)	20-134-SW-3	06/29/94 1405	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-3	SE	Upgradient of WR-9 in southeast side of unnamed tributary	N/A	N/A	N/A	N/A	N/A	20-134-SE-3	06/29/94 1405	T-Metals
SE-500	SE	500' downgradient from SW-1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis
SE-1000	SE	1,000' downgradient from SW-1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ____

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	*(SO_3)*
Presence of evaporative salt deposits?	*(ESD)*
Discolored or turbid seepage?	*(SPG)*
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	*(FEOX)*
Presence of burned or stressed vegetation?	*(VEG)*
$pH \leq 5.0$	*(pH)*

General Potential for AMD Mitigation:

Area available for treatment (acres)? Approximately 0.5 to 1 acre where base of WR-1, WR-2, and mill building are located.

Wetlands present: Yes___, No X, Describe:

Carbonate rocks/soils: Yes___, No X, Describe:

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30___; 30-100 X; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments

Nearest residence:___<1,000 ft;___1,000 ft - 0.5 miles; X >0.5 miles.

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Bisch, Flammang, West

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
WR-1	Moderate SO3	Dry	71,370	71,370	No	Low
WR-2	Moderate SO3	Dry	26,740	26,740	No	Low
WR-3	Moderate SO3	Dry	2,490	1,990	No	Low
WR-4	Moderate SO3	Dry	400	380	No	Low
WR-5	Moderate SO3	Dry	16,170	4,040	No	Low
WR-6	Moderate SO3	Dry	10,370	2,075	No	Low
WR-7	None	Dry	490	0	No	Low
WR-8	Moderate SO3	Dry	7,700	2,080	Yes	Moderate
WR-9	None	Dry	960	575	No	None
WR-10	None	Dry	910	230	No	Low
TP-1	None	Dry	ND	ND	Yes	Low
Adit #1	FEOX; Filamentous algae	N/A	N/A	N/A	N/A	N/A

Notes and Clarifications: Very spotty nature of tailings prevented accurate determination of extent.

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes_____, No_X__,
Describe:____

Population within 1 mile: 1-10___; 10-30___; 30-100_X_; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments____

Evidence of recreational use on site: Yes_X_, No___, Describe: Vehicle tracks; litter; two recreationalists stopped to look at collapsed mill.

Accessibility (check each that apply):_X_**Easily accessible - no fences, gates, or warning signs;**___**Moderately Accessible - barbed wire fences, road gated, or signs posted;**___**Difficult Access - chain-link fence, road gated and locked, site guarded (does not include locked or manned access points located more than 0.5 miles from the actual site).**

Sensitive environments on-site or adjacent to site:
State or National Parks - Yes___, No_X_, Comment__________________
Wilderness Area - Yes___, No_X_, Comment__________________
T&E Species Habitat - Yes___, No_X_, Comment__________________
Bat Habitat - Yes_X_, No___, Comment Possible, open adits

Primary Drainage___; Secondary Drainage___; No Information_X_:
Riparian Habitat Quality - High___, Medium___, Low___
Wetlands Frontage - High___, Medium___, Low___
Fisheries Habitat and Species Classification - ___
Sport Fishery Classification - ___

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, No___, Number_5__, types and locations: Adits #2, 3, 4, 5, and 6

Hazardous structures: Yes_X_, No___, Number_1__, types and locations: Mill building

Unstable highwalls, pits, trenches, slopes: Yes_X_, No___, Number_1__, types and locations: 30' highwall associated with open pit

Unstable waste piles, impoundments, undercut banks: Yes_X_, No____, Number_5__, types and locations: WR-1, -3, -5, -6, and -8 are all very steep.

Fire and/or Explosion hazards: Yes___, No_X_, Explain:__________________

Bibliography

MBMG, Well Log Database, July 14, 1994.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Free Coin/Red Cloud, Prepared by Northern Engineering and Testing, September 2, 1987.

USGS, Topographic Map, Elevation Mountain, Montana, 7 1/2 minute Quadrangle, 1965.

LABORATORY ANALYTICAL DATA

FREE COIN/RED CLOUD
PA NO. 20-134

Free Coin/Red Cloud PA# 20-134
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BISCH
INVESTIGATION DATE: 06/29/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-134-SE1	0.6 JX	7.2 J	662	0.7 J	7.0 J	14.6 J	41.4 J	17500	1.03	500 J	9.0 JX	48.2	6.1 U	44.1 J	NR
20-134-SE2	1.0 UJX	9.1 UJ	254	0.9 UJ	10.5 J	32.8 J	54.3 J	29500	0.51	712 J	16.8 JX	40.9	10.2 U	134 J	NR
20-134-SE3	1.3 UJX	12.0 UJ	378	3.5 J	197 J	13.9 J	1150 J	31000	1.59	20800 J	70.2 JX	48.9	13.3 U	161 J	NR
20-134-WR1	4.8 JX	9.3 J	164	0.6 J	9.1 J	10.1 J	61.4 J	23600	2.44	565 J	6.7 JX	171	5.2 U	38.1 J	NR
20-134-WR5	3.3 JX	37.4 J	40.0	0.5 UJ	5.8 J	13.6 J	104 J	37900	2.08	322 J	10.8 JX	137	13.9	37.7 J	NR
BACKGROUND	1.3 JX	7.8 J	209	0.4 UJ	6.2 J	12.1 J	10.9 J	15300	0.06	797 J	9.4 JX	6.0 U	5.0	40.2 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
20-134-WR1	0.42	13.1	20.7	7.61	0.02	0.21	0.19	6.56	14.2
20-134-WR5	0.17	5.31	2.29	-3	0.04	0.01	0.12	0.31	1.97

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
20-134-GW1	0.12 U	2.3 JX	25.4	2.6 U	8.7 U	4.7 U	4.6 U	6040	0.11 U	1320	8.0 U	1.6	29.4 U	4.5 U	329
20-134-SW1	0.12 U	2.0 JX	43.6	2.6 U	8.7 U	4.7 U	5.6	74.3	0.11 U	9.4	8.0 U	1.5	29.4 U	4.5 U	195
20-134-SW2	0.12 U	1.3 UX	50.6	2.6 U	8.7 U	4.7 U	4.6 U	480	0.11 U	29.1	8.0 U	1.3	29.4 U	7.4	185
20-134-SW3	0.12 U	1.5 JX	30.2	2.6 U	8.7 U	4.7 U	10.3	212	0.11 U	91.2	8.0 U	1.3	29.4 U	8.1	167

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
20-134-GW1	401	<5.0	184	0.07	NR
20-134-SW1	233	<5.0	67	0.12	NR
20-134-SW2	191	<5.0	41	<0.05	NR
20-134-SW3	241	<5.0	143	<0.05	NR

LEGEND

SE1 - Downstream 50' of last settling pond in First Chance Gulch.
SE2 - Upstream in First Chance Gulch.
SE3 - Side upgradient of WR9 in unnamed tributary.
WR1 - Composite of subsamples WR1A, 1B, 2A, and 2B.
WR5 - Grab sample of subsample WR5.
BACKGROUND - From the Free Coin/ Red Cloud Mine (20-134-SS1).

GW1 - Discharge associated with Adit #1; discharge flows 25' over dump material and discharges into First Chance Gulch.
SW1 - Same as sample 20-134-SE1.
SW2 - Same as sample 20-134-SE2.
SW3 - Same as sample 20-134-SE3.

XRF ANALYSIS RESULTS

FREE COIN/RED CLOUD
PA NO. 20-134

Mine Name: Free Coin/Red Cloud PA# 20-134
XRF Field Analyses
Results in PPM

XRF SAMPLE I.D.	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Ni	Cu	Zn	As	Sr
20-134-SE1000		10435	7394.99	982.248	299.98 *	805.945 *	19656.1			99.8241 *	152.474 *	56.6193 *	101.486
20-134-SE500		10486	8020.95	699.274 *		710.252 *	15301.5				126.144 *	60.639 *	109.105
20-134-TP1		18569.2	1853.58	622.634 *			18796.5				67.1038 *	77.1407 *	14.3944 *
20-134-TP2A		18018.2	2701.82	530.477 *		454.308 *	18140.5			168.291 *	76.8998 *		126.828
20-134-TP2A-DUP		18490.9	2637.51	672.86 *		429.833 *	18267.4			140.939 *	77.6893 *		121.457
20-134-TP2BA		28684.8	9048.59	1682.01		1699.37 *	38303.4				98.837 *	82.2108 *	201.593
20-134-TP2BB		23674.3	10805	1624.67		2010.34 *	36945				132.515 *	109.658 *	138.002
20-134-WR1A		21050.3	4618.27	1309.6		595.285 *	38516.2				91.2434 *	82.8498 *	160.798
20-134-WR1B		15391.2	8596.28	1057.99		1387.7 *	26962.7				137.787 *	88.129 *	172.317
20-134-WR1-COMP		23670.9	8984.36	1280.47		1732.28 *	36030.3				122.448 *	92.6523 *	164.953
20-134-WR2A		17374.8	5848.89	1098.29		1284.11 *	33915.8				181.111 *	76.2898 *	147.715
20-134-WR2B		24508.8	9923.71	1642.62		1235.87 *	31610.8			108.044 *	160.021 *	79.1403 *	160.05
20-134-WR5		22077.6	1943.3	1817.32		819.34 *	55463.5			125.105 *	130.714 *	109.011 *	20.2873 *
20-134-WR6		23733.7	5075.31	1797.43		981.461 *	36466.7			133.448 *	162.157 *	66.2895 *	138.261
20-134-WR8		28903.1	8015.9	2375.56		788.358 *	46742	572.071 *		85.0204 *	158.493 *	145.084 *	369.006
20-134-WR9		16543.4	3519.14	1471.52		1314.4 *	34083.6				123.959 *	102.653 *	16.9196 *

XRF SAMPLE I.D.	Zr	Hg	Mo	Pb	Rb	Cd	Sn	Sb	Ba	Ag	U	Th
20-134-SE1000	117.474				59.7399 *				520.694			11.0854 *
20-134-SE500	121.095		9.82387 *		78.0317				669.884	76.9051 *		
20-134-TP1	342.858		7.74758 *		63.5383				178.248			
20-134-TP2A	92.6959		75.6153	466.306	50.9857 *			286.478	5171.63			
20-134-TP2A-DUP	94.493		62.9212	466.646	47.644 *		71.1552 *	333.213	5251.72			
20-134-TP2BA	218.201		38.5013	69.7795 *	118.446				661.76			14.6755 *
20-134-TP2BB	176.472		25.4962 *		113.28				450.886			
20-134-WR1A	177.307		43.3083	162.72	106.675				384.946			
20-134-WR1B	134.165		10.8236 *		97.7036			70.4871 *	565.339			
20-134-WR1-COMP	181.779		32.7936	46.5228 *	133.008				685.492			
20-134-WR2A	170.498		32.1823	58.34 *	105.361				576.238			10.8846 *
20-134-WR2B	182.362		19.2929 *		119.497				918.716			
20-134-WR5	258.75		54.8896	118.919 *	128.362				284.427			12.133 *
20-134-WR6	180.325		9.96738 *	142.68 *	128.493				527.216			
20-134-WR8	159.397		27.1399 *		111.647			107.741 *	2676.15			
20-134-WR9	223.206		12.0921 *		107.709				232.045			16.3818 *

* = Estimated Quantity

$ = Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

FREE COIN/RED CLOUD
PA NO. 20-134

AIMSS SCORESHEET

SITE NAME: Free Coin/Red Cloud
PA NUMBER: 20-134

LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	2.065
6	GW - TARGETS	WELLS - 1 MI. x 2.5		0.0
7		WELLS - 1 TO 4 MI		6
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	6.0
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	4956
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
12		EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	400
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	2.454
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		1
18		WETLANDS		10
19		FISHERY		5
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	23
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	22577
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		5
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	25
27		LIKELIHOOD SCORE	LINES 25 + 26C	25
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.022
29	AIR - TARGETS	POPULATION - 4 MILES		30
30		NEAREST RESIDENCE		0
31		WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	30
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	17
		DIRECT CONTACT PATHWAY		
36		OBSERVED EXPOSURE		50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	150
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.019
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		30
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		5
43		TARGETS SCORE	SUM LINES 40 THRU 42	35
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	100
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE	(LINES 10 + 24 + 35 + 44) / 100,000		0.28

SITE NAME: Free Coin/Red Cloud
PA NUMBER: 20-134

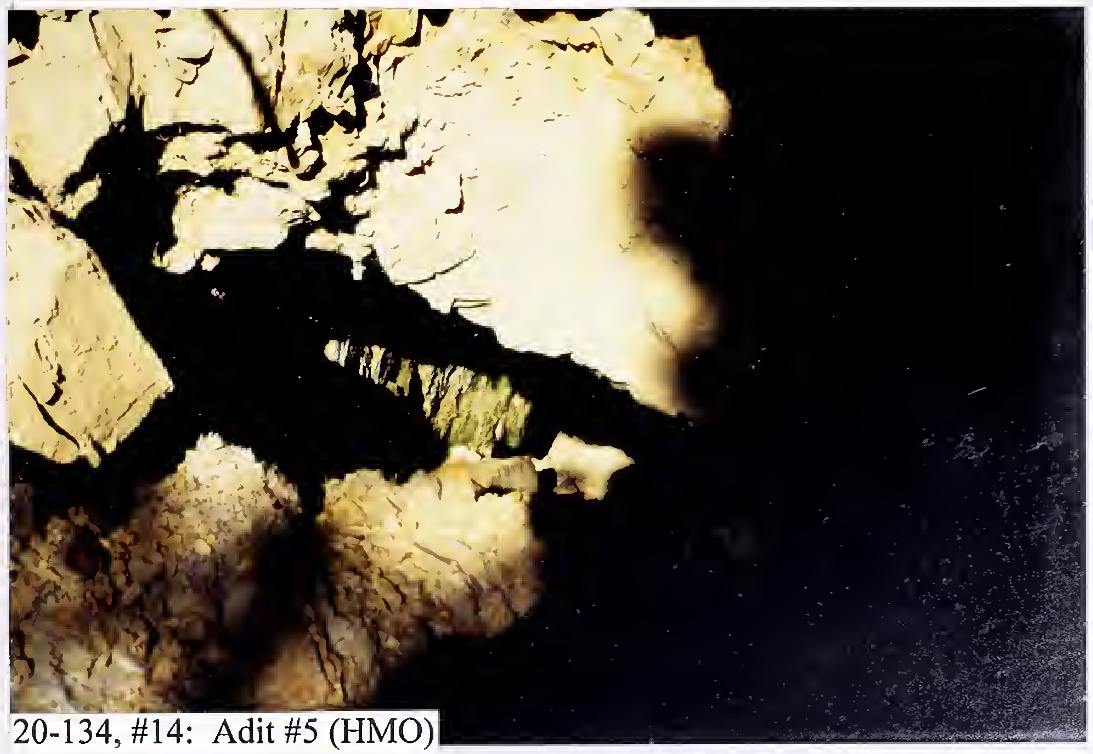
SITE SAFETY

LINE NO.				
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	100
3		OPEN ADITS	50 EA.	250
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	75
5		HAZ. STRUCTURES	40 EA.	40
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	465
9		POPULATION - 1 MILE		30
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		5
12		TARGETS SCORE	SUM LINES 9 THRU 11	35
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	325.50

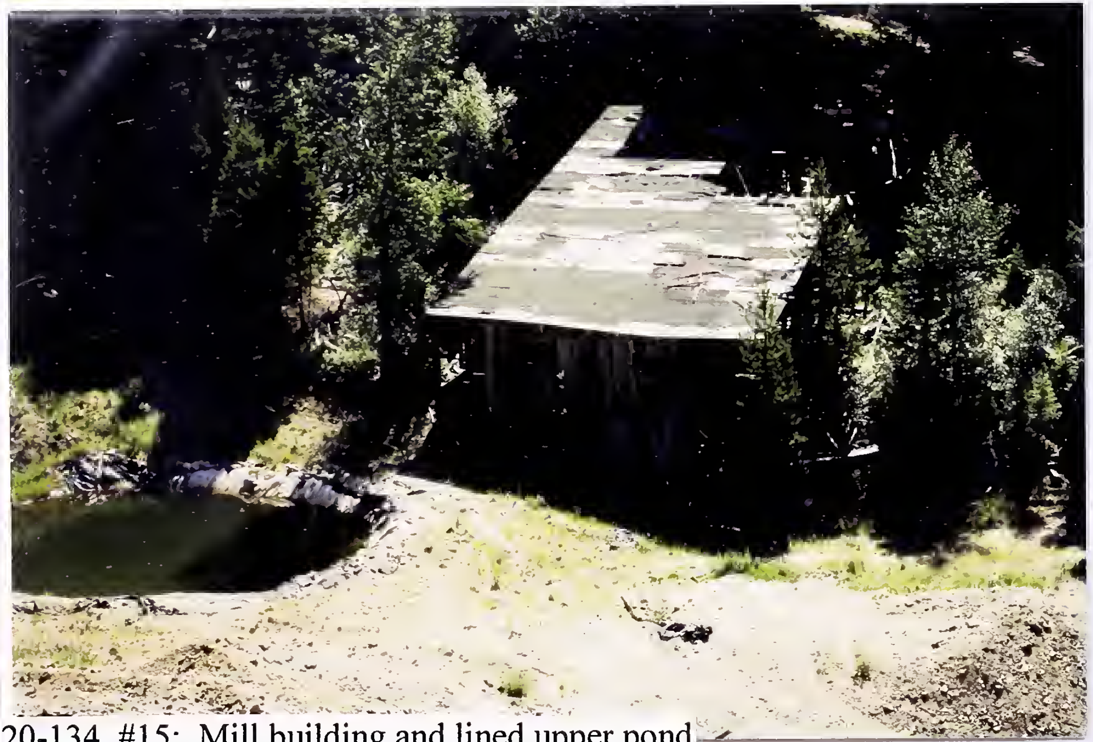
20-134, #11: Adit #4 (HMO)

20-134, #12: WR-4

20-134, #13: Adit #2 (HMO)



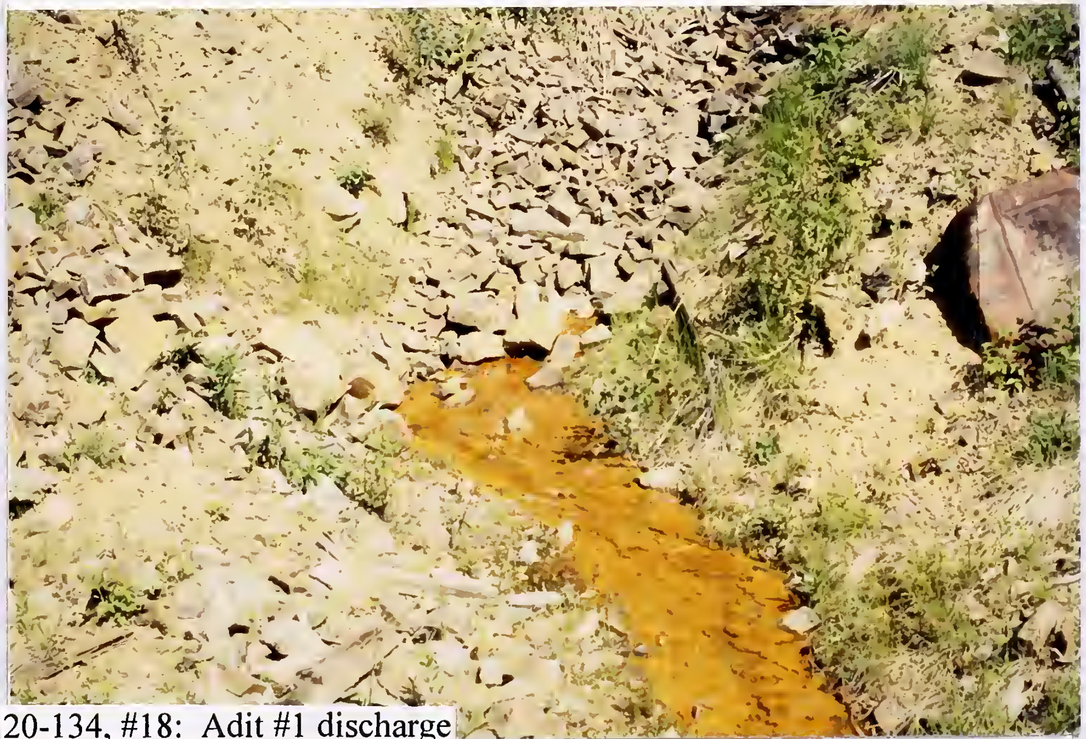
20-134, #14: Adit #5 (HMO)



20-134, #15: Mill building and lined upper pond

20-134, #16: WR-1

20-134, #17: WR-1



20-134, #18: Adit #1 discharge

20-134, #19: WR-6

20-134, #20: WR-8

20-134, #21: SW-2 sample location

PHILIPSBURG

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: LITTLE GEM **PA#:** 20-071

Date: July 5, 1994 **Time:** 1000-1900

Field Team Leader: Flammang, Pioneer

Sampling Personnel: Belanger, West; Pioneer

Visitors: None

Weather/Seasonality Observations: Cloudy; rain in late afternoon; cool (65°-70°F); windy (10 mph).

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #4: Wooden loadout and work shed facing east; #5: WR-3 and collapsed loadout facing northwest; #6: Surface of TP-2 facing northwest; #7, #8: Slopes of TP-2 and subsample location TP-2A; #16: Open adit across from standing loadout; #17: Wooden loadout, hazardous structure; #18: WR-1 facing southeast; #19, #20: TP-1 from the southeast corner (also mill) facing northeast; #21: TP-1, mill, and waste rock dumps facing north-northeast; #22: Edge of TP-1, waste rock dump, and pit facing north; #23: Waste rock piles below mill, new mill building, and tailings, as well as slopes of TP-1. Video Tape No. 2

General Comments/Observations (not covered specifically in attached Inventory Forms): Site was sampled during the 1993 Hazardous Material Inventory as part of the Trout Mine (20-062) site investigation. A profile was taken of the tailings in 1994 to further characterize them as they were composited with tailings from the Trout in 1993. No new waste rock samples were taken. Tailings present on the site were apparently flumed from the Trout Mill.

Other Hazardous Materials/Substances Present: There is an old transformer case on the ground east of the Little Gem shaft; it is empty with no sign of oil staining.

General Comments on Potential Remedial Alternatives: Contour, amend, and revegetate.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): LITTLE GEM **PA#:** 20-071

Legal Description: T 7N **;R** 13W **;Sec.** 30 **,** NE **1/4** SW **1/4** ___ **1/4**

County: GRANITE **Mining District:** PHILIPSBURG

Latitude: N 46° 19' 43" **Longitude:** W 113° 16' 22"

Primary Drainage Basin and Code: Camp Creek/17010202
Secondary Drainage Basin: Cliff Gulch

USGS Quadrangle map name(s): Philipsburg

Mine Type/Commodities: Hardrock/Silver, Gold, Lead, Zinc

Activity Status: Active___**,Inactive/Exploration**___**,Abandoned** X **.**

Ownership: Known Y___ **N** X **; private/public?** Private
Owner, Agent, or Contact (Include address and phone when available)**:** Unknown

Relationship to other mines/sites in the area/district: The Little Gem was not claimed until 1920 and was part of the west Algonquin lode complex. Tailings present on Little Gem site flumed from the Trout Mine.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? Two adits have been culvert closed and shaft has been grated by MDSL.

General site features: Elevation 5800'-5940'**, Slope** 20°**,**
Aspect North

Land use: Mining___**, Recreational** X **, Residential**___**, Urban**___**,**
Agricultural___**, Other(Specify)**___

Area of disturbed/unvegetated lands? Approx. 3.7 **acre(s).**
Site Dimensions: 400 feet x 400 feet

Predominant vegetation types: Lodgepole pine, Douglas fir, reedgrass, elk sedge, grouse whortleberry

Access: roads - good (paved)___**,poor (maintained dirt road)** X **,**
4wd X **,trail**___**.**
Other logistical considerations (proximity to other sites). Dirt road to Trout Mine; Little Gem site reached on an overgrown 4wd road.

Well logs within 1 mile radius; (Attach MBMG Well Log Printout(s): There are 7 wells reported within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Deposit occurs in Hasmark and Red Lion Formations (limestone and shales) near their contact with Philipsburg batholith. Site lies on the south side of dry drainage identified in some literature as Cliff Gulch. Water flowing in Cliff Gulch would flow west away from site to confluence with Camp Creek approx. 3/4 mile west of the mine. Camp Creek would flow into Flint Creek approx. 1 mile away on the west side of Philipsburg which flows north. However, there no longer appears to be topographical surface connection between Camp Creek and Flint Creek due to development in the town of Philipsburg.

Mining/milling history, ore type/tenor, host rock, gangue: The Little Gem was claimed in the 1920s. The vein has been exploited through a number of shallow shafts and pits and is reported to have produced altogether approx. $10,000 worth of silver. Mineralization is similar to the Trout Mine immediately adjacent to the east. Gangue is quartz, rhodochrosite, calcite, and dolomite. Ore is composed of galena, zinc blende (sphalerite), pyrite, ruby silver, gray copper, and manganese compounds.

Mine Operation?

Shafts - **Yes** X, **No** ___, **#** 1, **Comment** Grated

Adits - **Yes** X, **No** ___, **#** 3, **Comment** 2 culvert closed; 1 open

Pits - **Yes** ___, **No** X, **#** ___, **Comment** ___

Placers - **Yes** ___, **No** X, **#** ___, **Comment** ___

Other - **Yes** ___, **No** X, **#** ___, **Comment** ___

Mill Operation? **Yes** ___, **No** X. **If yes answer the next three questions:**

Period(s) of Operation: Tailings present on-site were flumed from the Trout Mill; there are two mills at Trout with unknown operation dates.

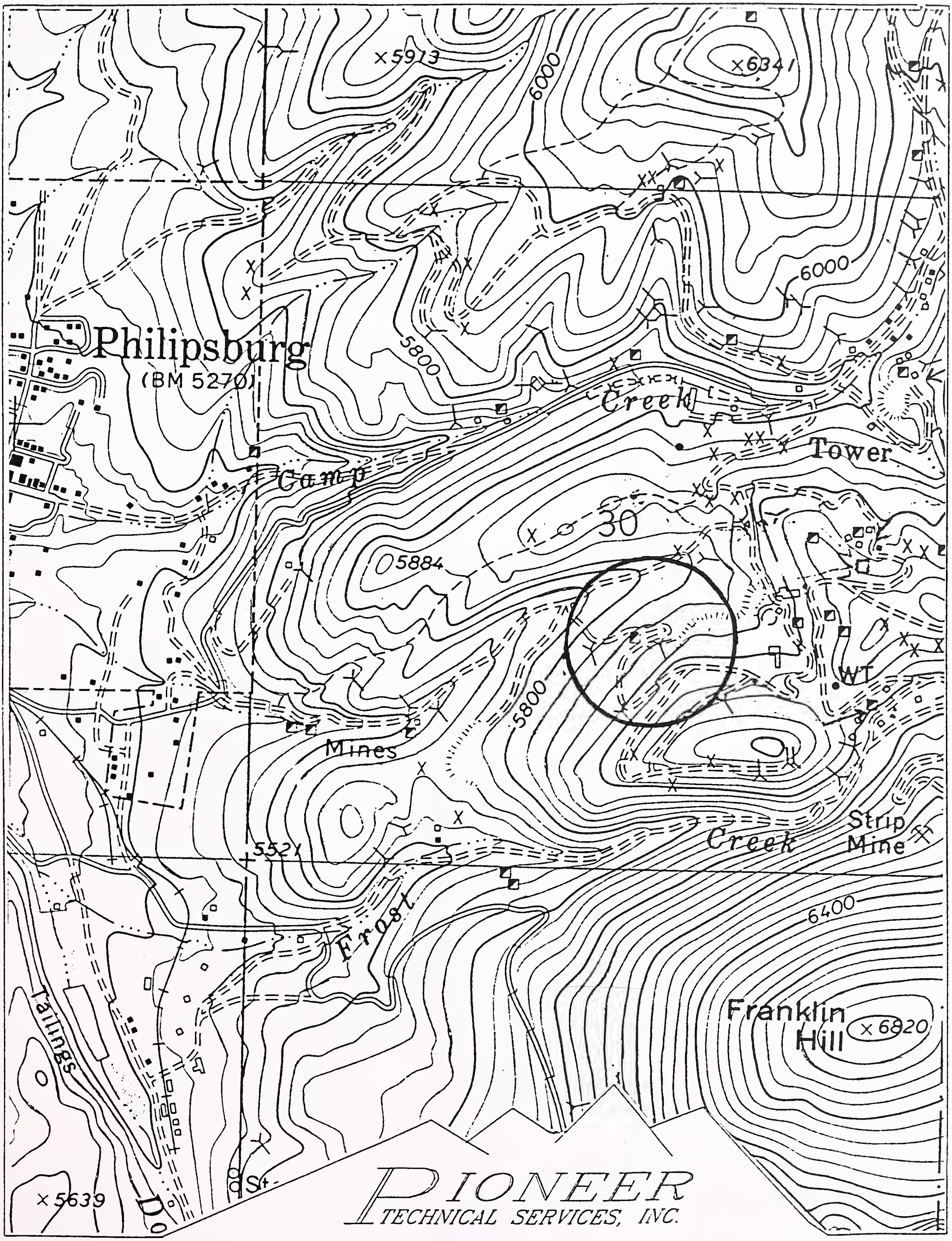
Origin of Ore Milled - Custom Mill ___ **Dedicated Mill** ___; **Number and names of mines that supplied mill feed:** Unknown

Process? Hg-amalgam, CN⁻ leach (vat, heap), floatation, smelting? No information available. A kiln is present at the Trout.

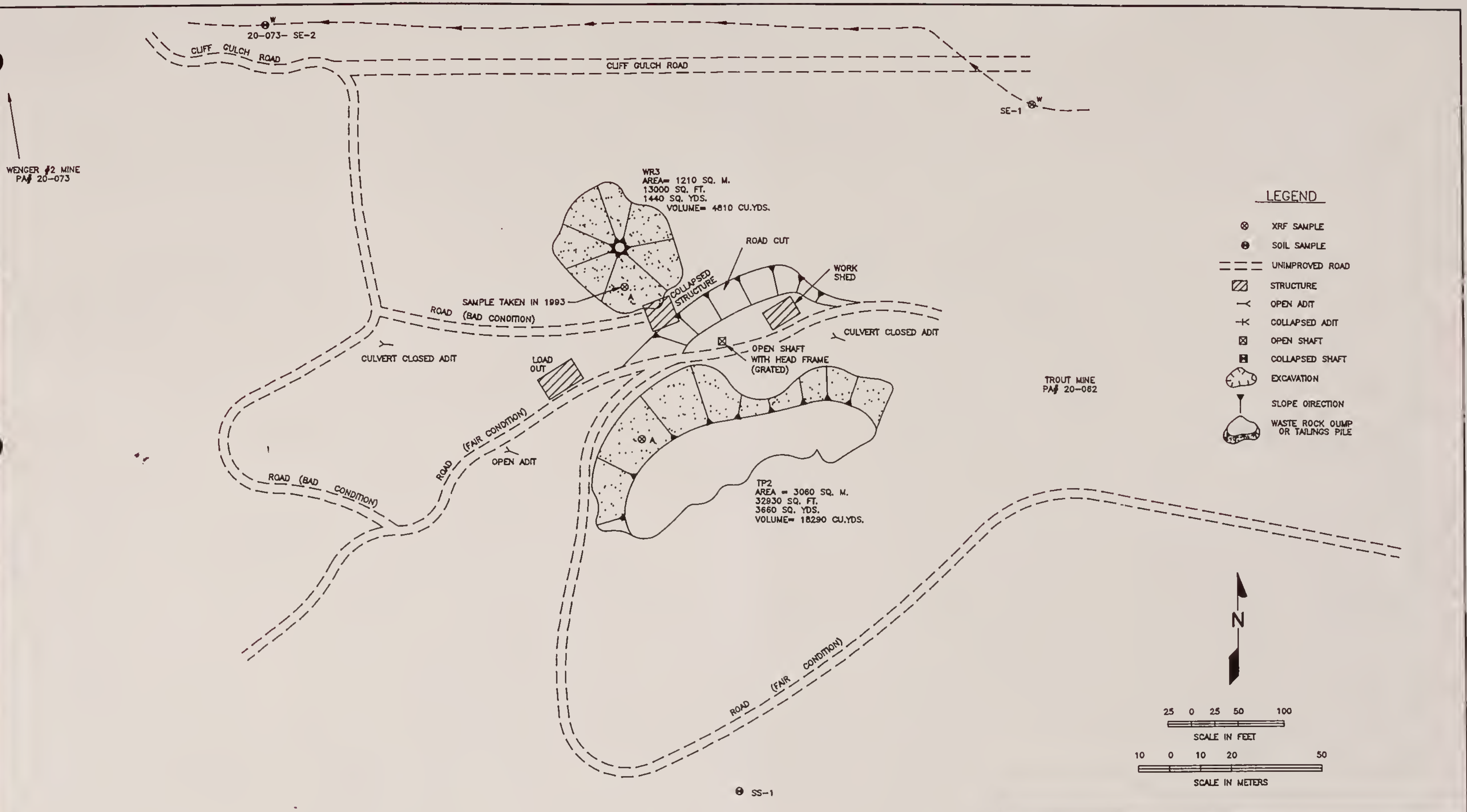
Montana Bureau of Mines and Geology
Water Well Log Data

08/10/1994

Well No.	Location	Depth	Yield	Static Water Level
M:55960	07N 14W 25	192.0	0.0	0.00
M:55961	07N 14W 25	35.0	20.0	0.00
M:55980	07N 14W 36 BA	90.0	0.0	38.00
M:55981	07N 14W 36 BADD	125.0	0.0	0.00
M:55982	07N 14W 36 CAB	45.0	50.0	20.00
M:55983	07N 14W 36 CACC	68.0	20.0	48.00
M:55984	07N 14W 36 CC	48.0	4.0	11.00



LITTLE GEM, P.A. NO. 20-071
T07N, R13W, SECTION 30
SCALE: 1" = 1000'



DRAWN FOR:

PIONEER
TECHNICAL SERVICES, INC.

TITLE:

LITTLE GEM
PA# 20-071

DRAWING NO.: PT340203 REV: -
DATE: 11/27/94 PLOT SCALE: 1 = 30

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. **Waste Characteristics** - *Use table on following page.*

Unique source identification: (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures/vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. **TAILINGS IMPOUNDMENTS** - *If tailings impoundments are also present, complete the following questions.*

Describe the tailings grain size distribution (approximate % sand, silt, & clay): 100% sand

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): Depth is 25+ feet on the northwest side; 0-5 feet appears to be oxidized gray, orange, and yellow sand; 5-25 feet is gray sand.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Dry

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): No impoundment

Comments on potential for mitigation: Grade, amend, and revegetate.

SOURCE INVENTORY FORM

SAMPLERS: Belanger, West

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd³)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
TP-2A-1	TAIL	18,290	Southeast face of TP-2, profile; surface sample	None	5.8 (D)	0.03	20-071-TP-1	07/05/94 1815	T-Metals, ABA
TP-2A-2	TAIL		Southeast face of TP-2, profile; 0-5', layers of gray, orange, and yellow sand	None	> 3.5 (D)	0.03			
TP-2A-3	TAIL		Southeast face of TP-2, profile; 5-10', gray sand	None	6.0 (D)	0.03	20-071-TP-2	07/05/94 1820	T-Metals, ABA
TP-2A-4	TAIL		Southeast face of TP-2, profile; 10-15', gray sand	None	5.7 (D)	0.03			
TP-2A-5	TAIL		Southeast face of TP-2, profile; 15-20'	None	5.8 (D)	0.03			
TP-2A-6	TAIL		Southeast face of TP-2, profile; 20-25'	None	6.2 (D)	0.03			
TP-2T	TAIL		1993 Trout investigation; surface grab on top of east end TP-2	None	5.5 (D)	0.04	20-062-TP-1	06/21/93 1700	T-Metals, ABA, Cation exchange, Mechanical
WR-3A	WR	4,810	1993 Trout investigation; below Little Gem shaft	None	NM	NM	20-062-WR-3	06/21/93 1807	T-Metals, ABA
SS-1	SOIL		Background soil	N/A	N/A	N/A	20-071-SS-1	07/05/94 1630	T-Metals

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 20-071-TP-1 is composite of TP-2A-1 and -2A-2. 20-071-TP-2 is composite of TP-2A-3 through -2A-6. During 1993 investigation, 20-062-TP-1 was a composite of TP-1A (Trout), TP-2 (Little Gem), and TP-3 (Wenger No. 2) surface samples. NM = Not Measured

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No_X_, Number:____ Identification:______________

Filled shafts: Yes___, No_X_, Number:____ Identification:______________

Seeps/Springs: Yes___, No_X_, Number:____ Identification:______________

Groundwater wells within 4 miles?: Yes_X_, No___;
Number of well logs: 56

Distance to nearest well used for drinking:
___<1,000 ft;_X_1,000 ft to 0.5 miles;___>0.5 miles.

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable____, Possible_X__, Unlikely____.
Large uncontained source (tailings) with elevated lead and zinc present.

Approximate Depth to Groundwater:___<25 ft;_X_ 25 - 100 ft;___ >100 ft.

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

SAMPLERS: ______________________________

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.												

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ______________________________

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: **Yes**____, **No**_X_, **Name(s):**__________

Dry streambeds: **Yes**_X__, **No**____, **Name(s):** Dry channel of Cliff Gulch approximately 500 feet below the site

Other surface water: **Yes**____, **No**_X_, **Name(s)/Description:**__________

Waste materials within any floodplain: **Yes**____, **No**_X_ **Source ID(s):**_

Approximate Flood frequency?___**1 yr,**___**10 yr,**___**100 yr**

Estimated seasonal flow of stream(s) (cfs/gpm)? N/A
High Flow:__________, **Average Flow:**__________

Distance between waste source(s) and nearest surface water body (ft)? 1,000+ feet

Surface water draining onto or through waste sources: **Yes**____, **No**_X__,
Describe: Precipitation only

Surface water use within 15 miles downstream? **(Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)**
Agriculture, irrigation; however, no apparent surface connection between Camp Creek and Flint Creek.

Observed erosional/sedimentation/stream turbidity problems? **Yes**_X__, **No**______. **Distance downstream (ft)? 0-500**___; **500-1,000**___; **>1,000**_X_.
Describe/explain **(Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):** Cliff Gulch is full of tailings, mostly from the Trout TP-1 pile, though tailings can be tracked through the woods from TP-2 to Cliff Gulch. At SE-1 sample point, channel choked with tailings, only tailings in 3' streambank cut.

SURFACE WATER INVENTORY FORM

SAMPLERS: Flammang

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SE-1	SE	Upgradient of Little Gem; downgradient of Trout; approx. 75' from toe of waste rock (Trout) in valley	N/A	N/A	N/A	N/A	N/A	20-071-SE-1	07/05/94 1650	T-Metals
SE-2	SE	Upgradient of Wenger #2; downgradient of Little Gem and White Horse mines; west of road in defined drainage; 200' up from road to base of TP-3 (Wenger No. 2)	N/A	N/A	N/A	N/A	N/A	20-073-SE-2	07/05/94 1630	T-Metals

*FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ______

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	*(SO_3)*
Presence of evaporative salt deposits?	*(ESD)*
Discolored or turbid seepage?	*(SPG)*
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	*(FEOX)*
Presence of burned or stressed vegetation?	*(VEG)*
pH ≤ 5.0	*(pH)*

General Potential for AMD Mitigation:

Area available for treatment (acres)? None

Wetlands present: Yes___, No X, Describe:

Carbonate rocks/soils: Yes X, No___, Describe: Limestone present as host rock.

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30___; 30-100___; 100-300___; 300-1,000___; 1,000-3,000 X; 3,000-10,000___; 10,000 or greater___; Comments Town of Philipsburg

Nearest residence:___<1,000 ft; X 1,000 ft - 0.5 miles;___>0.5 miles.

For each source (table next page):

Available fine materials? *Surface area?*

Uncovered and unvegetated? *Wet or dry?*

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: West

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
WR-3	None	Dry	13,000	13,000	Yes	Low
TP-2	pH	Dry	32,930	29,640	Yes	Observed

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes_____, No_X_,
Describe:____

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___; 300-1,000_X_; 1,000-3,000____; 3,000-10,000____; 10,000 or greater____;
Comments Town of Philipsburg is nearby.

Evidence of recreational use on site: Yes_X_, No___, Describe: Litter; well established motorbike track from Trout through site to Wenger #2.

Accessibility (check each that apply): _X_**Easily accessible - no fences, gates, or warning signs;**___**Moderately Accessible - barbed wire fences, road gated, or signs posted;**___**Difficult Access - chain-link fence, road gated and locked, site guarded (does not include locked or manned access points located more than 0.5 miles from the actual site).**

Sensitive environments on-site or adjacent to site:

State or National Parks -	**Yes___,**	**No_X_,**	**Comment**________
Wilderness Area -	**Yes___,**	**No_X_,**	**Comment**________
T&E Species Habitat -	**Yes___,**	**No_X_,**	**Comment**________
Bat Habitat -	**Yes_X_,**	**No___,**	**Comment** Possible, open adit

Primary Drainage_X_; Secondary Drainage___; No Information___:

Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium_X_, Low___
Fisheries Habitat and Species Classification - _4_
Sport Fishery Classification - _3_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, No___, Number_1__, types and locations:___
Open adit

Hazardous structures: Yes_X_, No___, Number_3__, types and locations:_
Headframe; two buildings

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____, types and locations:____

Unstable waste piles, impoundments, undercut banks: Yes_X_, No_____, Number_2___, types and locations: WR-3 is steep, unvegetated, and at angle of repose. TP-2 composition makes it unstable and steep.

Fire and/or Explosion hazards: Yes___, No_X_, Explain:____

Bibliography

MBMG, Well Log Database, July 14, 1994.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Little Gem, Prepared by Northern Engineering and Testing, July 2, 1987.

MDSL/AMRB Files, Montana Cultural Resources Inventory Form for Little Gem, Prepared by GCM Services, Inc., Date Unknown.

USGS, Geology and Ore Deposits of the Philipsburg Quadrangle, Montana, Professional Paper 78, Written by William Harvey Emmons and Frank Cathcart Calkins, 1913.

USGS, Topographic Map, Philipsburg, Montana, 7 1/2 minute Quadrangle, 1971.

LABORATORY ANALYTICAL DATA

LITTLE GEM
PA NO. 20-071

Little Gem PA# 20-071
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - FLAMMANG
INVESTIGATION DATE: 07/05/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-062-WR3	NR	10 J	39.5	9.8	4.7	14.7	323	15600	0.054 JX	581	12	13	4 UJ	1480	NR
20-071-SE1	60.4	225 J	1690	16.4 J	1.8	7.9 J	168 J	13500	0.75 J	20900	2.3 JX	2240	18.2 JX	9560	NR
20-073-SE2	55.4	252 J	2120	15.9 J	2.0	9.6 J	191 J	14700	0.74 J	22500	5.0 JX	1990	16.1 JX	8940	NR
20-071-TP1	53.0	309 J	808	3.8 J	1.9 U	7.8 J	111 J	24500	1.18 J	6510	3.4 JX	903	6.4 UJX	2590	2.28
20-071-TP2	68.5	189 J	846	15.1 J	2.5	8.7 J	145 J	12200	1.03 J	29600	1.6 UJX	2890	18.8 JX	9250	1.23
BACKGROUND	8.6	169 J	484	1.6 J	6.6	12.6 J	44.4 J	15600	0.63 J	3830	7.3 JX	192	6.7 UJX	440	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
20-071-TP1	2.06	64.4	25.6	-39	0.78	1.03	0.25	32.2	-6.54
20-071-TP2	1.33	41.5	146	104	0.19	0.96	0.18	30.0	116

LEGEND

SE1 - Upgradient of Little Gem; downgradient of Trout; approx. 75' from toe of waste rock (Trout) in valley.
20-073-SE2 - Upgradient of Wenger #2, downgradient of Little Gem and White Horse Mines.
TP1 - Composite of subsamples TP2A-2 and 2A-3.
TP2 - Composite of subsamples TP2A-4 through 2A-6.
20-062-WR3 - Grab sample of the WR3 subsample; from the Trout mine.
BACKGROUND - From the Little Gem Mine (20-071-SS1).

XRF ANALYSIS RESULTS

LITTLE GEM
PA NO. 20-071

MDSL AMRB/PIONEER 5/16/94

Mine Name: Little Gem PA# 20-071
XRF Field Analyses
Results in PPM

XRF SAMPLE I.D.	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	NI	Cu	Zn	As	Sr
20-071-TP1-COMP		12770.4	8684.17	672.629 *		7812.94	25531.4				1732.36	259.946 *	387.782
20-071-TP2A1		16221.9	5357.62	911.077		6096.05	8542.96				1797.7	136.742 *	410.962
20-071-TP2A2		9308.98	12138.5	503.18 *		9001.89	40651.3			89.696 *	2335.63	451.589 *	350.972
20-071-TP2A3		8989.32	29188.4	648.37		8224.13	9338.75			93.3696 *	5950.26		263.388
20-071-TP2A4		6578.72	50093.3	296.495 *		39058.6	8904.85			101.849 *	8277.79		251.047
20-071-TP2A5		13087.1	42728.6	770.794		17546.8	11362.2			114.17 *	6105.78		382.268
20-071-TP2A6		7125.45	46802.4	438.537 *		53410.5	10307.4				6583.03		395.603
20-071-TP2-COMP		9304.46	44473.1	569.189 *		30689.5	11013.9				6979.73		307.668

XRF SAMPLE I.D.	Zr	Hg	Mo	Pb	Rb	Cd	Sn	Sb	Ba	Ag	U	Th
20-071-TP1-COMP	147.538			851.854	65.0223 *				779.163	98.4774 *		
20-071-TP2A1	167.498			679.264	71.3645				766.455			
20-071-TP2A2	118.418			765.592	63.7303 *	635.258						
20-071-TP2A3	164.287			1648.68	56.1691 *				582.092			
20-071-TP2A4	80.5538			1677.48	40.4928 *				741.723			
20-071-TP2A5	137.487			1177.99	70.0243 *				932.794			
20-071-TP2A6	88.8282			2010.13	65.0846 *				263.574			
20-071-TP2-COMP	109.871			1921.81	54.3861 *				799.296	158.304 *		

* = Estimated Quantity

$ = Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

LITTLE GEM
PA NO. 20-071

MDSL AMRB/PIONEER 5/16/94

AIMSS SCORESHEET

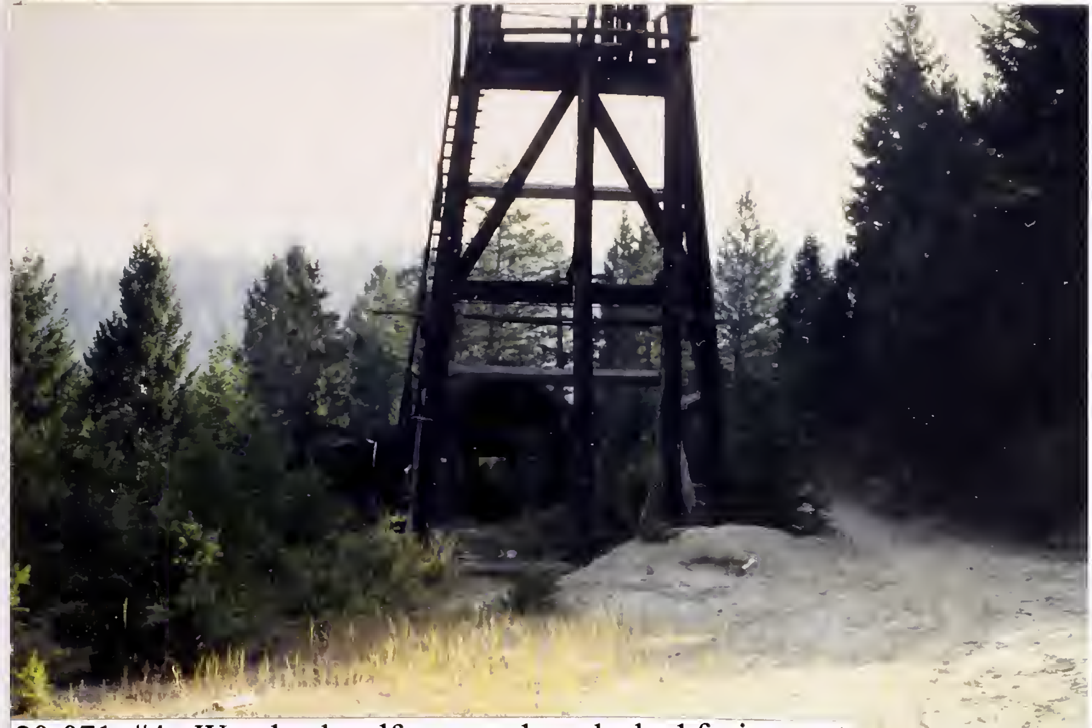
SITE NAME: Little Gem
PA NUMBER: 20-071

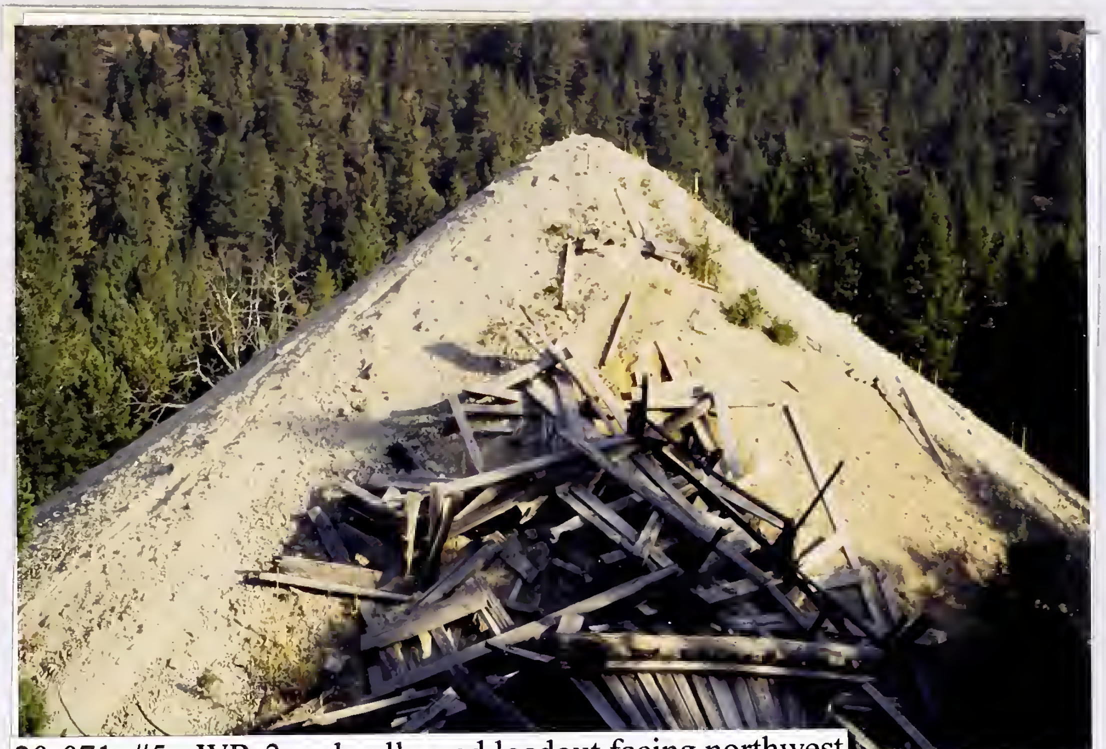
LINE NO.				
		GROUNDWATER PATHWAY		
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		10
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	200
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	200
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	34.732
6	GW - TARGETS	WELLS - 1 MI. x 2.5		17.5
7		WELLS - 1 TO 4 MI		49
8		NEAREST WELL		5
9		TARGETS SCORE	LINES 6 + 7 + 8	71.5
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	496668
		SURFACE WATER PATHWAY		
11		OBSERVED RELEASE		0
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		2
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	40
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	40
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	38.552
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		1
18		WETLANDS		0
19		FISHERY		1
20		RECREATION		0
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	4
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	6168
		AIR PATHWAY		
25		OBSERVED RELEASE		200
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		5
26B		DISTANCE TO POPULATION		10
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	250
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.133
29	AIR - TARGETS	POPULATION - 4 MILES		1000
30		NEAREST RESIDENCE		5
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	1015
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	33749
		DIRECT CONTACT PATHWAY		
36		OBSERVED EXPOSURE		50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		10
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	200
38		LIKELIHOOD SCORE	LINES 36 + 37C	250
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.119
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		300
41		NEAREST RESIDENCE		5
42		RECREATIONAL USE		5
43		TARGETS SCORE	SUM LINES 40 THRU 42	310
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	9223
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE (LINES 10 + 24 + 35 + 44) / 100,000			5.46

SITE NAME: Little Gem
PA NUMBER: 20-071

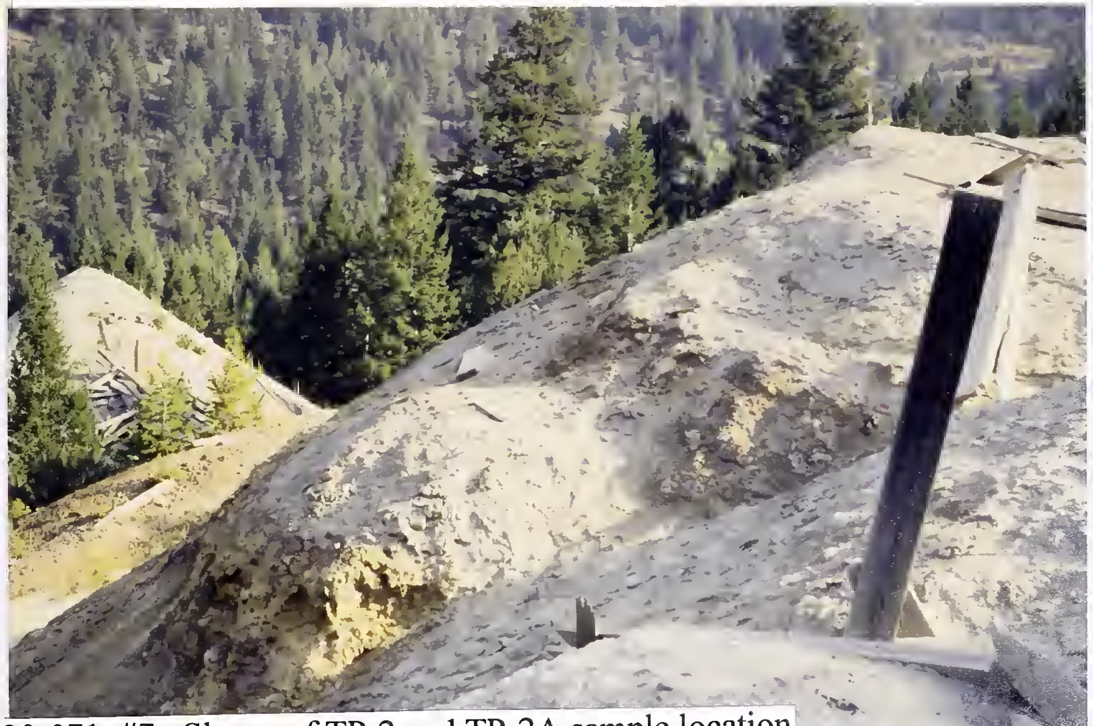
SITE SAFETY

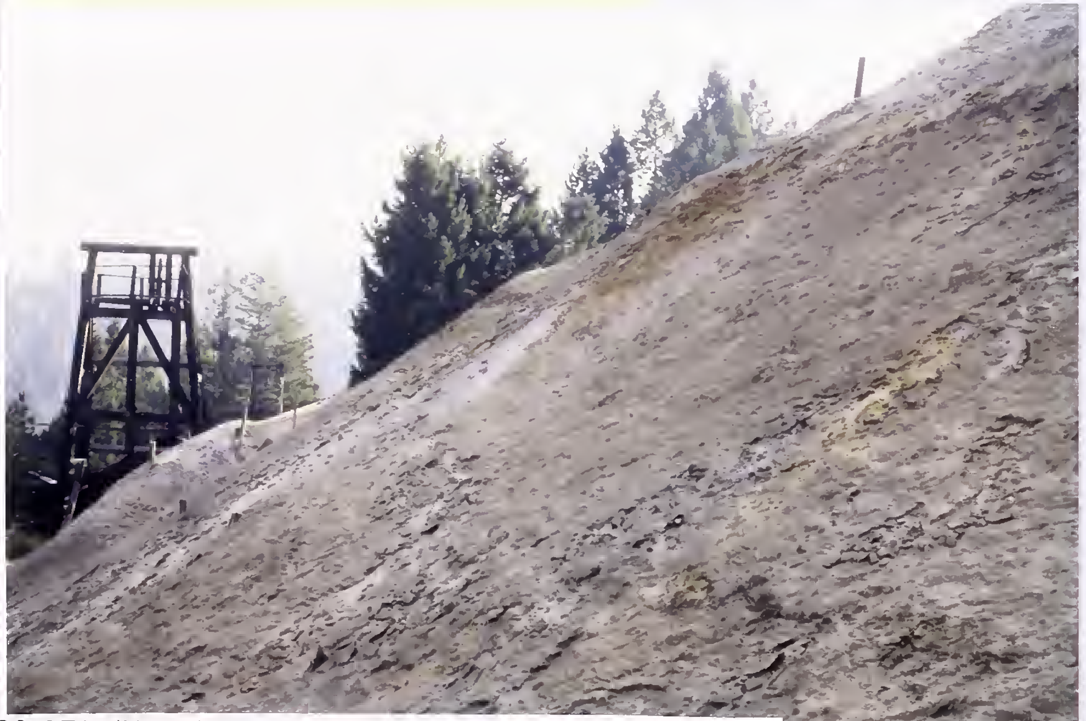
LINE NO.				
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	50
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	120
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	170
9		POPULATION - 1 MILE		300
10	TARGETS	NEAREST RESIDENCE		5
11		RECREATIONAL USE		5
12		TARGETS SCORE	SUM LINES 9 THRU 11	310
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	1054.00


20-071, #4: Wooden headframe and work shed facing east

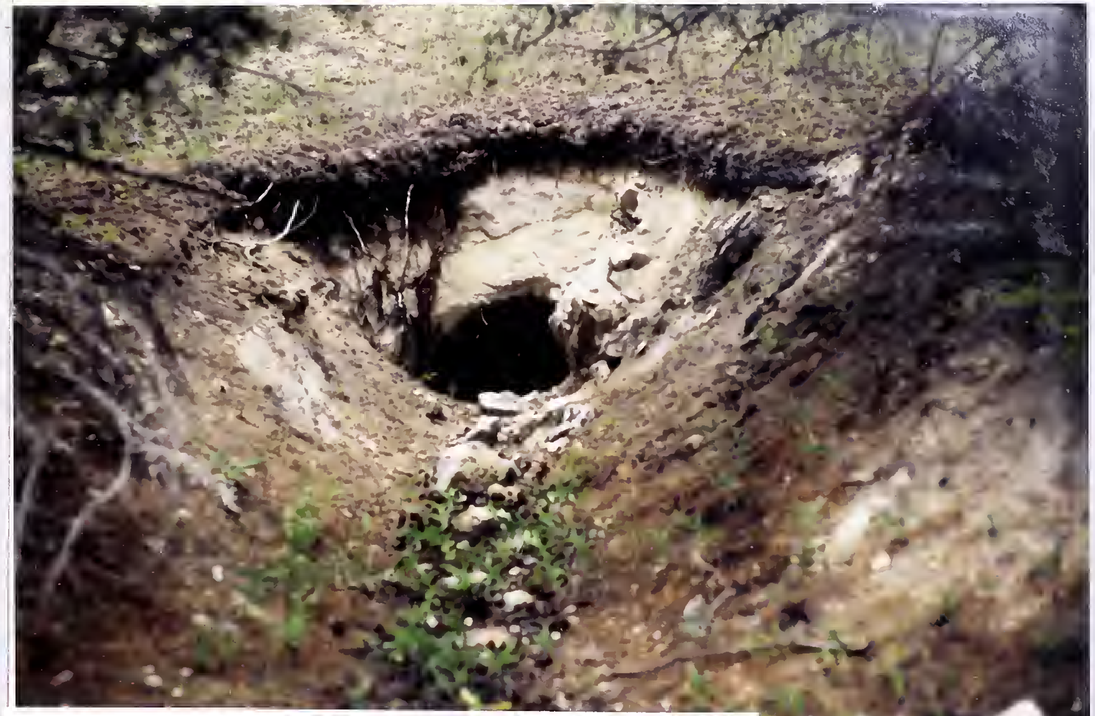

20-071, #5: WR-3 and collapsed loadout facing northwest

20-071, #6: Surface of TP-2 facing northwest

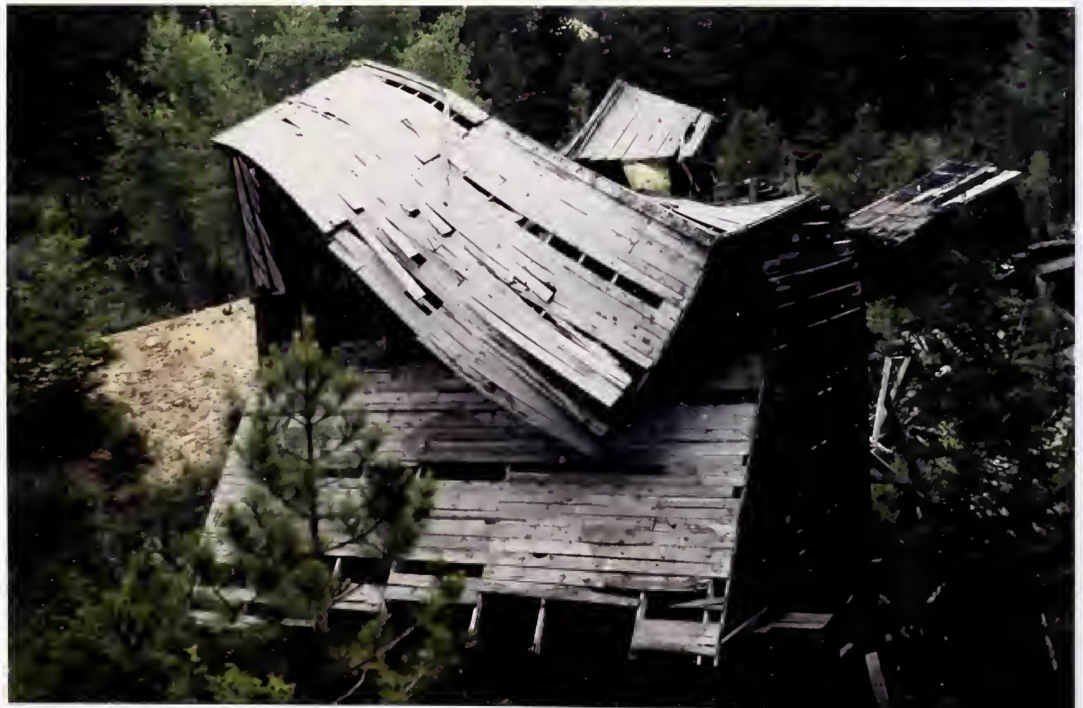

20-071, #7: Slopes of TP-2 and TP-2A sample location



20-071, #8: Slopes of TP-2 and TP-2A sample location



20-071, #16: Open adit across from standing loadout



20-071, #17: Wooden loadout (hazardous structure)

20-071, #18: WR-1 facing southeast

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: WENGER NO. 2 **PA#:** 20-073

Date: July 5, 1994 **Time:** 1200-1900

Field Team Leader: Flammang, Pioneer

Sampling Personnel: Belanger, West; Pioneer

Visitors: None

Weather/Seasonality Observations: Cloudy; windy; cool (65°-70°F); turning to rain in the late afternoon.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number)**:** #12: TP-3A facing northeast toward TP-3B (Note: Motorbike trail up side); #13: WR-3 facing northeast; #14: WR-4 facing northwest; #15: Inclined adit (HMO). Video Tape No. 2

General Comments/Observations (not covered specifically in attached Inventory Forms)**:** Tailings at the Wenger #2 were sampled during the 1993 Hazardous Materials Inventory as part of the Trout (20-062) site as TP-3 (that designation was retained for this investigation). A surface sample was collected and combined with samples taken at the Little Gem and Trout. The tailings apparently came from the Trout; a flume ran from the Trout mills to the Litte Gem and Wenger #2 tailings. The tailings sample profile is comparable to the Trout tailings profile.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Grade, contour, amend, and revegetate.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): WENGER NO. 2 **PA#:** 20-073

Legal Description: **T** 7N **;R** 13W **;Sec.** 30 **,** SW **1/4** SW **1/4** ____ **1/4**

County: GRANITE **Mining District:** PHILIPSBURG

Latitude: N 46° 19' 10" **Longitude:** W 113° 16' 47"

Primary Drainage Basin and Code: Camp Creek/17010202
Secondary Drainage Basin: Cliff Gulch

USGS Quadrangle map name(s): Philipsburg

Mine Type/Commodities: Hardrock/Silver, Gold, Lead, Zinc

Activity Status: **Active**___**,Inactive/Exploration**___**,Abandoned** X **.**

Ownership: Known Y___ **N** X **; private/public?** Private
Owner, Agent, or Contact (Include address and phone when available)**:** Unknown

Relationship to other mines/sites in the area/district: Tailings from this site were flumed from the Trout site.

Regulatory Status (Activity by other agencies)? Hardrock permits?
Past Reclamation Activities? N/A

General site features: Elevation 5600'-5800'**, Slope** 15°**,**
Aspect North

Land use: Mining___**, Recreational** X **, Residential**___**, Urban**___**,**
Agricultural___**, Other(Specify)**

Area of disturbed/unvegetated lands? Approx. 16.5 **acre(s).**
Site Dimensions: 900 feet x 800 feet

Predominant vegetation types: Lodgepole pine, aspen, juniper, wild roses, knapweed

Access: roads - good (paved)___**,poor (maintained dirt road)**___**,**
4wd X **,trail** X **.**
Other logistical considerations (proximity to other sites). Reach mine portion of site from road in Cliff Gulch that branches off by open pit at Trout Mine; reach tailings on overgrown road from the same road; can also hike to site from the Little Gem Mine.

Well logs within 1 mile radius; **(Attach MBMG Well Log Printout(s):** There are 7 wells reported within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Deposit occurs in the Hasmark and Red Lion Formations (limestone and shales) near the contact with the Philipsburg Batholith. Site lies on the south side of dry drainage identifed in some literature as Cliff Gulch. Water flowing in Cliff Gulch would flow west away from the site to confluence with Camp Creek approx. 1/2 mile west of the mine. Camp Creek would flow into Flint Creek approx. 1 mile away on the west side of Philipsburg; however, it appears to dissipate above Philipsburg with no evidence of water reaching a perennial stream. Flint Creek flows north.

Mining/milling history, ore type/tenor, host rock, gangue: No information available on Wenger #2, but the site is in the same area as Trout and Little Gem Mines, probably similar silver bearing replacement vein type deposit. Gangue at Trout and Little Gem were quartz, rhodochrosite, calcite, and dolomite. Ore composed of galena, zinc blende (sphalerite), pyrite, ruby silver and gray copper, with some manganese compounds. Host rock appeared to be limestone based on waste rock present at the site.

Mine Operation?
Shafts - **Yes** X, **No** ___, **#** 3, **Comment** 1 collapsed; 1 grated; 1 open
Adits - **Yes** X, **No** ___, **#** 7, **Comment** 2 culvert closed; 1 gated; 1 open; 3 collapsed
Pits - **Yes** ___, **No** X, **#** ___, **Comment** ___
Placers - **Yes** ___, **No** X, **#** ___, **Comment** ___
Other - **Yes** ___, **No** X, **#** ___, **Comment** ___

Mill Operation? **Yes** ___, **No** X. **If yes answer the next three questions:**

Period(s) of Operation: Tailings present on the site were flumed from the Trout mills.

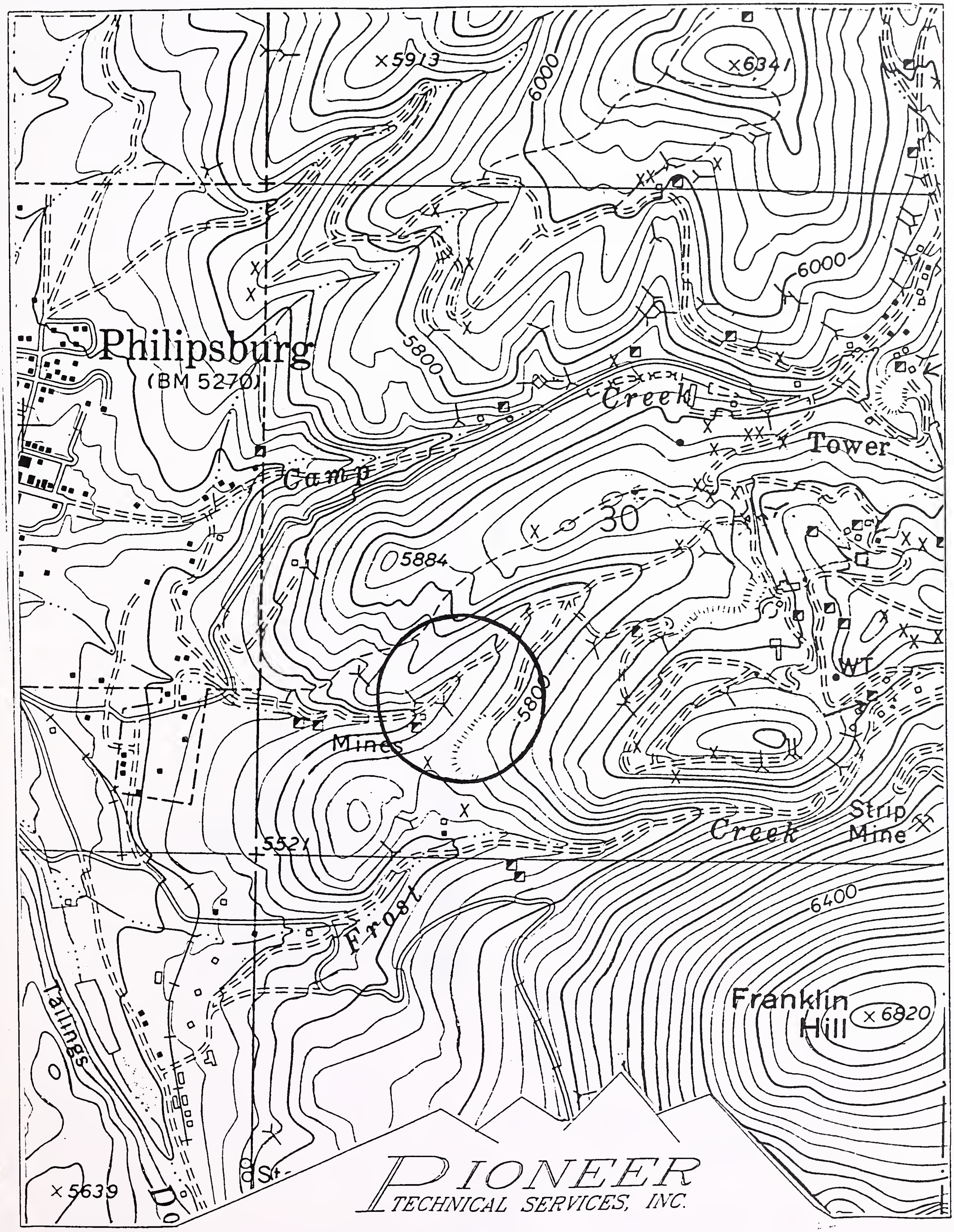
Origin of Ore Milled - Custom Mill ___ **Dedicated Mill** ___; **Number and names of mines that supplied mill feed:** N/A

Process? Hg-amalgam, CN^- leach (vat, heap), floatation, smelting?
No other information available. Kiln was present at the Trout Millsite.

Montana Bureau of Mines and Geology
Water Well Log Data

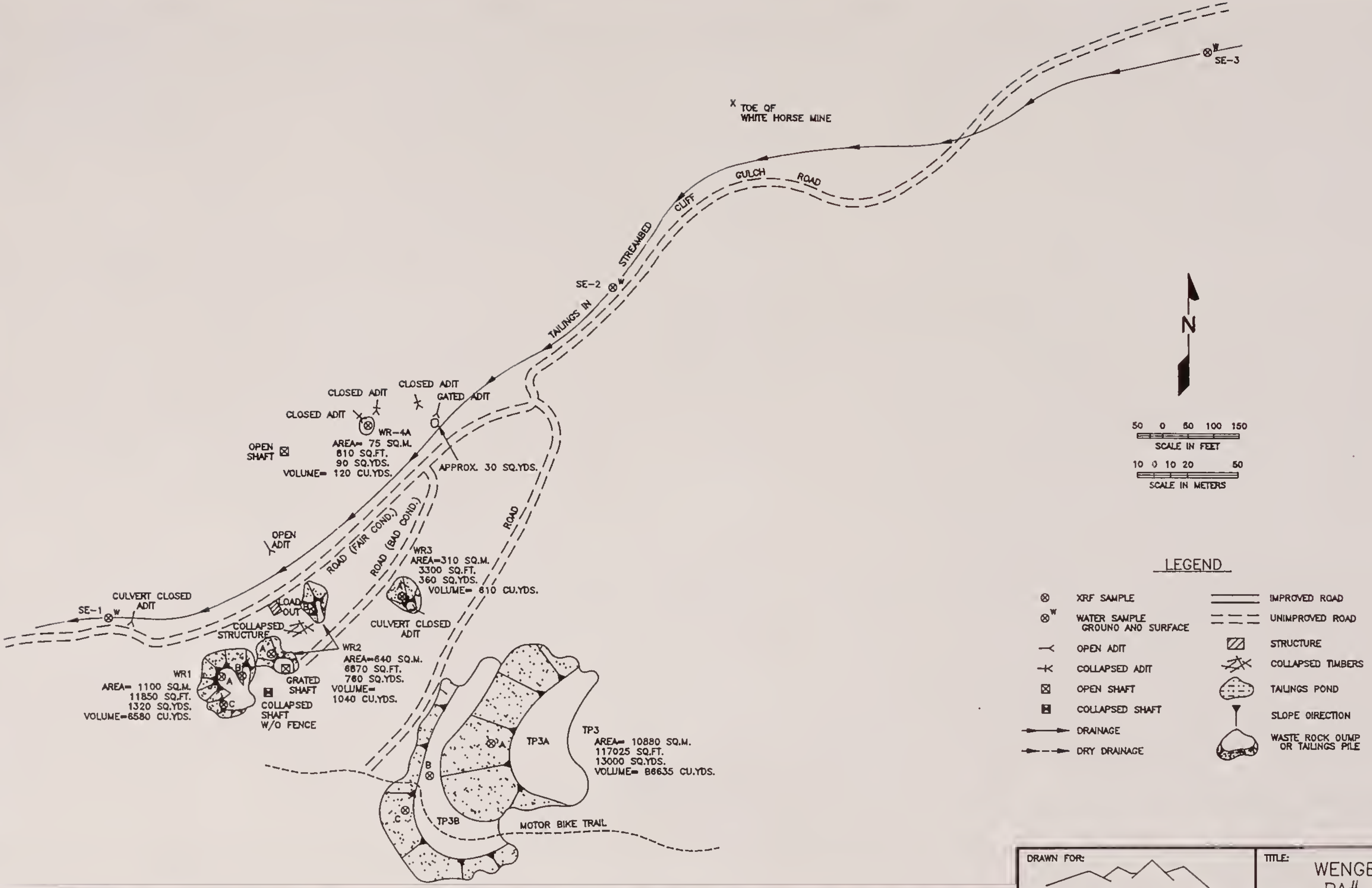
08/10/1994

Well No.	Location	Depth	Yield	Static Water Level
M:55960	07N 14W 25	192.0	0.0	0.00
M:55961	07N 14W 25	35.0	20.0	0.00
M:55980	07N 14W 36 BA	90.0	0.0	38.00
M:55981	07N 14W 36 BADD	125.0	0.0	0.00
M:55982	07N 14W 36 CAB	45.0	50.0	20.00
M:55983	07N 14W 36 CACC	68.0	20.0	48.00
M:55984	07N 14W 36 CC	48.0	4.0	11.00



PIONEER
TECHNICAL SERVICES, INC.

WENGER #2, P.A. NO. 20-073
T07N, R13W, SECTION 30
SCALE: 1" = 1000'



DRAWN FOR:

PIONEER
TECHNICAL SERVICES, INC.

TITLE:

WENGER NO. 2
PA# 20-073

DRAWING NO.: PT340202 REV: –
DATE: 11/15/94 PLOT SCALE: 1 = 60

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. **Waste Characteristics** - *Use table on following page.*

Unique source identification: (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures/vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. **TAILINGS IMPOUNDMENTS** - *If tailings impoundments are also present, complete the following questions.*

Describe the tailings grain size distribution (approximate % sand, silt, & clay): Tailings were 90% sand and 10% clay.

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): Tailings were at least 47' deep on deepest end of pile; 0-30' was light tan sand with a few layers of thin clays; 32'-45' was light tan sand with grayish tinge. Lower part of TP-3 (0-3') was light tan sand, layer of organics/loam, then tan and light orange clay; this may be under upper portion of pile also.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Dry

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): No impoundment, just a pile.

Comments on potential for mitigation: Grade, contour, amend, and revegetate.

SOURCE INVENTORY FORM

SAMPLERS: Flammang

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
WR-1A	WR	6,580	Associated with collapsed shaft; end of northwest lobe	None	7.2 (D)	0.03	20-073-WR-1	07/05/94 2215	T-Metals, ABA
WR-1B	WR		End of north lobe	None	7.0 (D)	0.03			
WR-1C	WR		Southwest of collapsed shaft	None	7.2 (D)	0.015			
WR-2A	WR	1,040	Northwest of grated shaft; near top of unvegetated part	None	7.0 (D)	0.02			
WR-2B	WR		East of loadout; west side, near middle, on top	None	7.2 (D)	0.02			
WR-3	WR	610	Associated with culverted adit on north end of site; northwest side, in middle, near top	None	7.0 (D)	0.02			
WR-4	WR	120	Unvegetated dump on west side of valley; east of collapsed adit	None	7.0 (D)	0.015	N/A	N/A	XRF Analysis
TP-3	TAIL	86,635	Taken during 1993 Trout investigation; northwest corner, near top	None	5.4 (D)	0.04	20-062-TP-1	06/21/93 1700	T-Metals, ABA
TP-3A-A	TAIL		Northwest corner of upper pile, profile; 0-5', light tan sand interlayered with clays	None	6.0 (D)	0.04	20-073-TP-1	07/05/94 2215	T-Metals, ABA
TP-3A-B	TAIL		5-15', tan sand interlayered with clay	None	6.0 (D)	0.03	20-073-TP-2	07/05/94 2215	T-Metals, ABA
TP-3A-C	TAIL		15-27', light tan sand with clay interlayers	None	6.45 (D)	0.04			
TP-3A-D	TAIL		32-37', tan sand with grayish tinge	None	7.0 (D)	0.03			
TP-3A-E	TAIL		37-45', tan sand with grayish tinge with interlayers of orange clayey sand	None	6.1 (D)	0.035			
TP-3B	TAIL		Southwest of TP-3A, lower pile in small erosion gully, profile; 0-3', tan and light orange clay interlayered	None	5.6 (D)	0.045			
TP-3C	TAIL		North center, on edge of lower tailings; soil underlying approx. 1' of tailings	None	5.7 (D)	0.03	N/A	N/A	XRF Analysis

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 20-073-WR-1 is composite of WR-1A through -1C, WR-2A and -2B, and WR-3. 20-073-TP-1 is a surface sample of TP-3A-A. 20-073-TP-2 is composite of TP-3A-B through -3A-E, and TP-3B. 20-062-TP-1 was a composite of surface tailings from Trout, Little Gem and Wenger #2. See Little Gem (20-071) for background soil sample.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No_X_, Number:____ Identification:____________

Filled shafts: Yes___, No_X_, Number:____ Identification:____________

Seeps/Springs: Yes___, No_X_, Number:____ Identification:____________

Groundwater wells within 4 miles?: Yes_X_, No___;
Number of well logs:_56___

Distance to nearest well used for drinking:
_X_<1,000 ft;___1,000 ft to 0.5 miles;___>0.5 miles.

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: · Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable____, Possible_X__, Unlikely____.
Large volume of uncontained source (tailings) with elevated levels of lead and zinc.

Approximate Depth to Groundwater:___<25 ft;_X_ 25 - 100 ft;___ >100 ft.

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

SAMPLERS: ____________________

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC μS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.												

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ____________________

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: **Yes**____, **No**_X_, **Name(s):**

Dry streambeds: **Yes**_X_, **No**___, **Name(s):** Cliff Gulch

Other surface water: **Yes**____, **No**_X_, **Name(s)/Description:**

Waste materials within any floodplain: **Yes**_X_, **No**___ **Source ID(s):** WR-2B; tailings from TP-3 have eroded down hillside into drainage.

Approximate Flood frequency? _X_ **1 yr,** ___ **10 yr,** ___ **100 yr**

Estimated seasonal flow of stream(s) (cfs/gpm)? 0
High Flow: 0.5 cfs, **Average Flow:** Dry

Distance between waste source(s) and nearest surface water body (ft)?
Unknown (< 1,000 feet)

Surface water draining onto or through waste sources: **Yes**____, **No**_X_,
Describe: Precipitation only

Surface water use within 15 miles downstream? **(Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)**
Agriculture, irrigation; however, no apparent surface connection between Camp Creek and Flint Creek

Observed erosional/sedimentation/stream turbidity problems? **Yes**_X_, **No**____. **Distance downstream (ft)? 0-500**___; **500-1,000**___; **>1,000**_X_.
Describe/explain **(Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):** Tailings present in Cliff Gulch from base of Trout to end of drainage; amount of tailings appear to decrease in volume further from Trout.

SURFACE WATER INVENTORY FORM

SAMPLERS: Flammang, Belanger

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC $\mu S/cm$ @ 25°C	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SE-1	SE	Downstream of culvert adit on west side of creek	N/A	N/A	N/A	N/A	N/A	20-073-SE-1	07/05/94 1620	T-Metals
SE-2	SE	Upgradient of Wenger #2, downgradient of Little Gem and White Horse Mines; west of road in defined drainage, 200' up from road to base of TP-3	N/A	N/A	N/A	N/A	N/A	20-073-SE-2	07/05/94 1630	T-Metals

*FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): Creek was dry the entire length. Creek at SE-1 flowed down road; sediment was mostly tailings. Creek at SE-2 had defined drainage; choked with tailings.

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides? (SO$_3$)

Presence of evaporative salt deposits? (ESD)

Discolored or turbid seepage? (SPG)

Presence of long filamentous algae in drainages, mosses in moist areas?

Presence of ferric hydroxide precipitates? (FEOX)

Presence of burned or stressed vegetation? (VEG)

pH ≤ 5.0 (pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? Approximately 2 acres where tailings are presently located

Wetlands present: Yes___, No X **, Describe:**

Carbonate rocks/soils: Yes X **, No____, Describe:** Sugar limestone present on all waste rock dumps; calcareous soils.

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30___; 30-100___; 100-300____; 300-1,000____; 1,000-3,000 X **; 3,000-10,000____; 10,000 or greater___; Comments** Town of Philipsburg

Nearest residence: X **<1,000 ft;___1,000 ft - 0.5 miles;___>0.5 miles.**

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Flammang

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
WR-1	None	Dry	11,850	8,890	Yes	Low
WR-2	None	Dry	6,870	3,435	Yes	None
WR-3	None	Dry	3,300	3,300	Yes	Low
WR-4	None	Dry	810	810	Yes	Low/Moderate
TP-3	None	Dry	117,025	117,025	Yes	Observed

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes_____, No_X__,
Describe:____

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___;
300-1,000_X_; 1,000-3,000____; 3,000-10,000____; 10,000 or greater____;
Comments Town of Philipsburg is nearby.

Evidence of recreational use on site: Yes_X_, No___, Describe: Defined motorcross trails on tailings; campfire ring; litter; someone target shooting in Cliff Gulch during site investigation.

Accessibility (check each that apply):_X_Easily accessible - no fences, gates, or warning signs;___Moderately Accessible - barbed wire fences, road gated, or signs posted;___Difficult Access - chain-link fence, road gated and locked, site guarded (does not include locked or manned access points located more than 0.5 miles from the actual site).

Sensitive environments on-site or adjacent to site:
State or National Parks - Yes___, No_X_, Comment______________
Wilderness Area - Yes___, No_X_, Comment______________
T&E Species Habitat - Yes_X_, No___, Comment Bald Eagle
Bat Habitat - Yes_X_, No___, Comment Open adits, possible

Primary Drainage_X_; Secondary Drainage___; No Information___:
Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium_X_, Low___
Fisheries Habitat and Species Classification - _4_
Sport Fishery Classification - _3_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, No___, Number_2__, types and locations:___ One adit across from loadout; one inclined adit, very hazardous, southwest of WR-4 approx. 75 feet.

Hazardous structures: Yes_X_, No___, Number_2__, types and locations:_ One partially collapsed cabin and walkway near WR-2A; collapsing loadout (three-story) and partially collapsing walkway south of WR-2B.

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____,
types and locations:______________________________

Unstable waste piles, impoundments, undercut banks: Yes_X_, No____, Number_1__, types and locations: Slopes on TP-3A are at angle of repose, but because sand content moves easily, TP-3A is oversteepened on southwest corner.

Fire and/or Explosion hazards: Yes___, No_X_, Explain:______________

Bibliography

MBMG, Well Log Database, July 14, 1994.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Wenger #2, Prepared by Northern Engineering and Testing, July 2, 1987.

USGS, Geology and Ore Deposits of the Philipsburg Quadrangle, Montana, Professional Paper 78, Written by William Harvey Emmons and Frank Cathcart Calkins, 1913.

USGS, Topographic Map, Philipsburg, Montana, 7 1/2 minute Quadrangle, 1971.

LABORATORY ANALYTICAL DATA

WENGER #2
PA NO. 20-073

Wenger No. 2 PA# 20-073
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - FLAMMANG
INVESTIGATION DATE: 07/05/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-073-SE1	28.9	150 J	1580	8.6 J	1.6 U	6.4 J	123 J	9140	0.70 J	15400	1.4 UJX	1430	7.1 JX	5310	NR
20-073-SE2	55.4	252 J	2120	15.9 J	2.0	9.6 J	191 J	14700	0.74 J	22500	5.0 JX	1990	16.1 JX	8940	NR
20-073-TP1	70.6	198 J	7050	10.0 J	1.9 U	7.3 J	644 J	9080	0.78 J	6440	7.5 JX	2340	23.4 JX	7860	2.28
20-073-TP2	52.4	520 J	3880	12.4 J	2.2	13.2 J	187 J	14300	1.22 J	16000	4.6 JX	1920	24.5 JX	6820	1.23
20-073-WR1	23.5	42.2 J	1940	3.8 J	2.2	4.5 J	330 J	7190	0.43 J	36900	1.3 UJX	272	4.8 UJX	2500	NR
BACKGROUND	8.6	169 J	484	1.6 J	6.6	12.6 J	44.4 J	15600	0.63 J	3830	7.3 JX	192	6.7 UJX	440	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
20-073-TP1	0.89	27.8	89.6	61.8	0.23	0.59	0.07	18.4	71.2
20-073-TP2	1.09	34.1	64.8	30.7	0.18	0.71	0.20	22.2	42.6
20-073-WR1	0.01	0.31	599	599	<0.01	<0.01	0.08	0.00	599

LEGEND

SE1 - Downstream of culvert adit on west side of creek.
SE2 - Upgradient of Wenger #2, downgradient of Little Gem and White Horse Mine; west of road in drainage.
TP1 - Grab sample of the TP3A-A subsample.
WR1 - Composite of subsamples WR1A through 1C, 2A, 2B, and 3.
BACKGROUND - From the Little Gem Mine (20-071-SS1).

XRF ANALYSIS RESULTS

WENGER #2
PA NO. 20-073

Mine Name: Wenger No. 2 PA# 20-073
XRF Field Analyses
Results in PPM

XRF SAMPLE I.D.	CrHI	K	Ca	TI	CrLO	Mn	Fe	Co	Ni	Cu	Zn	As	Sr
20-073-SE1		14100.2	72900.8	1008.6		21117.2	10687.3				4607.39		277.278
20-073-TP2-COMP		14488.3	12916.6	817.385		13944.8	10055.2			130.471 *	3966.04	245.344 *	365.411
20-073-TP3AA		11618.7	13980	468.736 *		7819.8	8489.69			77.0194 *	1937.6		251.454
20-073-TP3AB		8993.34	29152.6	431.614 *		14756.4	9289.13			138.961 *	4078.41	152.407 *	
20-073-TP3AC		9802.36	5465.84	726.339		6867.32	6435.1			77.6699 *	2385.11	125.113 *	242.996
20-073-TP3AD		12687.6	7683.87	704.312		20535.2	7857.48				6695.74		498.085
20-073-TP3AE		16406.2	7024.59	840.165		17989.1	13101.7				3536.19	643.622	366.785
20-073-TP3BA		22792.4	12386	1336.62		20201.3	13890.7			217.895 *	4123.73		469.779
20-073-TP3C		4602.02	168516	511.831 *		7228.45	7360.57			243.335 *	2460.04		193.547
20-073-WR1A		1919.93 *	193795	291.655 *		6193.9	3086.83				329.267	95.07 *	54.2942
20-073-WR1B		2274.43 *	176508	354.776 *		10286.5	6683.41				1111.51	91.9879 *	58.094
20-073-WR1C		1600.1 *	187501	228.626 *		978.318 *	1926.64				106.327 *	85.6342 *	44.3789
20-073-WR1-COMP		2486.32 *	202911	419.063 *		6637.58	4799.97				508.414	106.956 *	70.4156
20-073-WR2A		2758.65	159955	415.478 *		16127.5	7615.82				814.875	77.3927 *	71.7756
20-073-WR2B		817.827 *	198259	175.681 *		1604.45 *	2312.52				232.541 *	79.5148 *	43.8603 *
20-073-WR3A		1951.85 *	211355	281.542 *		1175.71 *	2577.36				235.367 *	100.41 *	67.1856
20-073-WR4A		1418.47 *	192593	701.306		919.221 *	2622.13				1302.87	82.3178 *	53.7439

XRF SAMPLE I.D.	Zr	Hg	Mo	Pb	Rb	Cd	Sn	Sb	Ba	Ag	U	Th
20-073-SE1	104.054			1182.56	43.6881 *				1477.28			
20-073-TP2-COMP	146.963			983.07	72.3191 *			60.9484 *	2372.5	93.9528 *		19.6681 *
20-073-TP3AA	134.909		12.5698 *	612.454	62.1749 *			57.5882 *	1540.81	75.8461 *		
20-073-TP3AB				952.18	34.1338 *		80.5814 *	109.917	5610.75	151.346 *		
20-073-TP3AC	188.402			446.523	43.6784 *				1345.11			
20-073-TP3AD	149.524			1543.36	66.8167 *			43.5976 *	672.843	67.1116 *		
20-073-TP3AE	119.555			1063.78	91.6889			78.0471 *	669.841	117.029 *		
20-073-TP3BA	131.885			1472.91	121.459	228.589 *		67.5256 *	3427.73			17.6722 *
20-073-TP3C	59.7879			789.969	29.2608 *				433.555			
20-073-WR1A	9.97332 *								183.39			
20-073-WR1B	29.5396			220.265					651.948			
20-073-WR1C	10.1548 *											
20-073-WR1-COMP	15.7689 *			49.6839 *					738.965			
20-073-WR2A	33.616			157.721 *	17.3563 *				673.474			
20-073-WR2B	6.45651 *								89.2265 *			
20-073-WR3A	10.4313 *											
20-073-WR4A	32.2121											

* = Estimated Quantity

$ = Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

WENGER NO. 2
PA NO. 20-073

AIMSS SCORESHEET

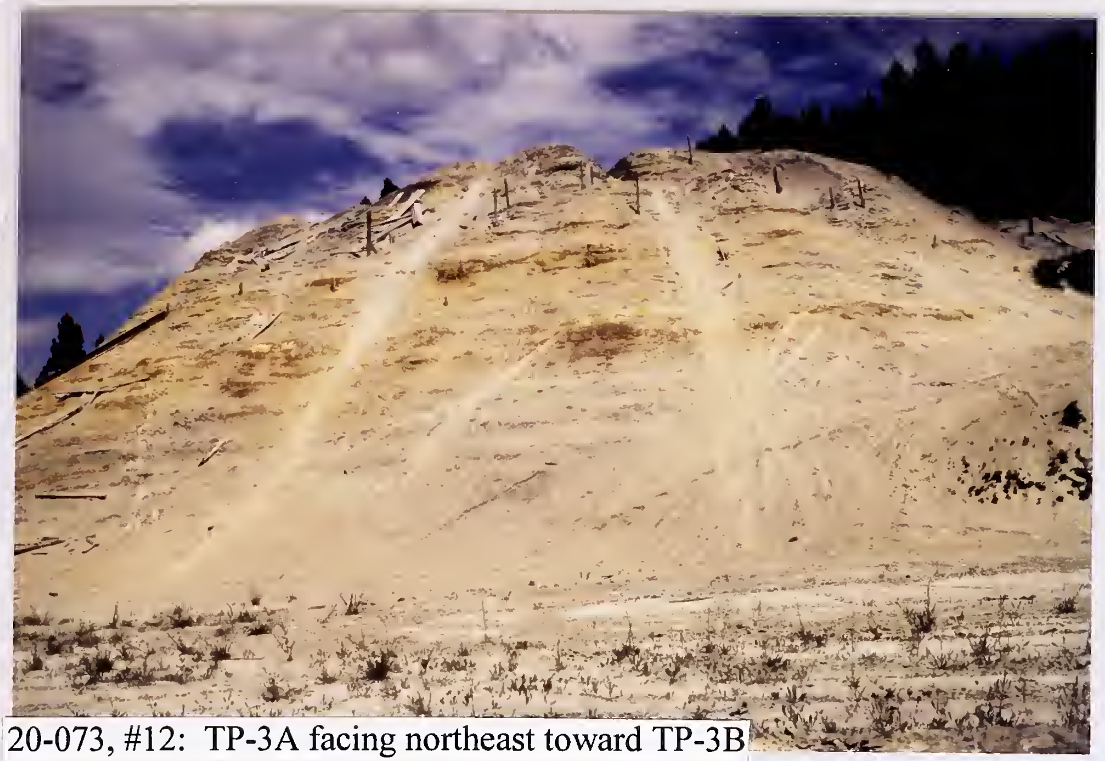
SITE NAME: Wenger #2
PA NUMBER: 20-073

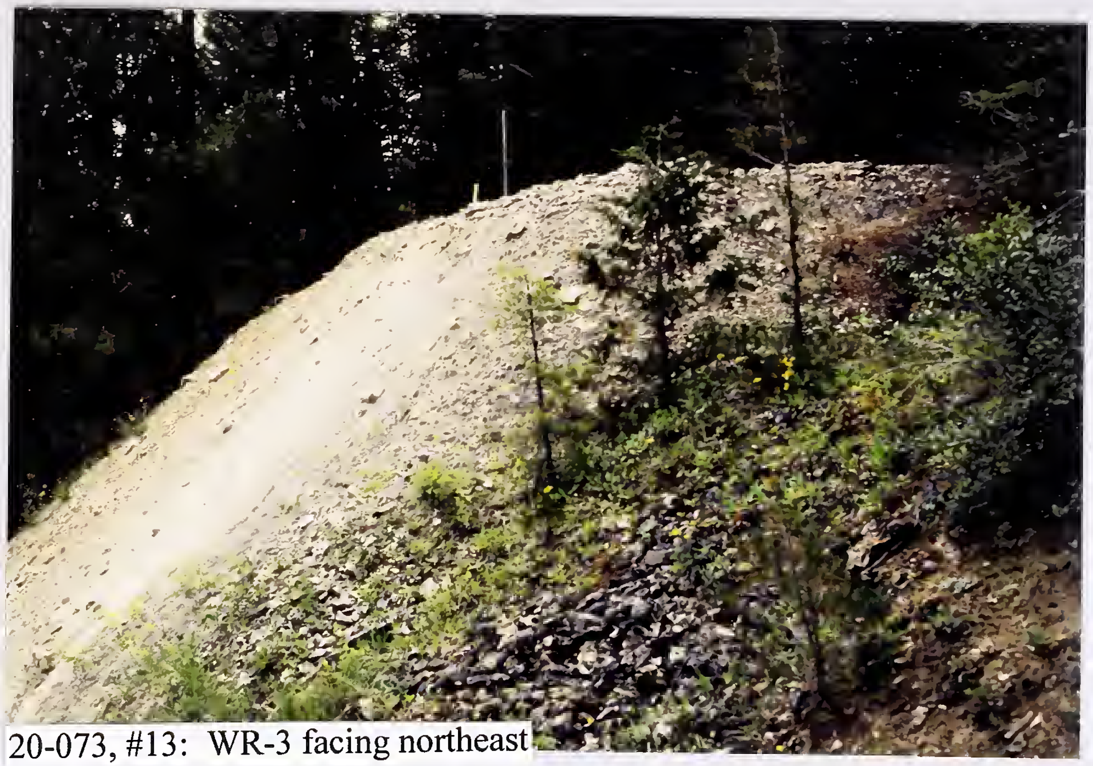
LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		10
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	200
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	200
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	257.734
6	GW - TARGETS	WELLS - 1 MI. x 2.5		17.5
7		WELLS - 1 TO 4 MI		49
8		NEAREST WELL		10
9		TARGETS SCORE	LINES 6 + 7 + 8	76.5
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	3943330
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
12		EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		2
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	40
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	40
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	267.563
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		1
18		WETLANDS		0
19		FISHERY		1
20		RECREATION		0
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		5
23		TARGETS SCORE	SUM LINES 16 THRU 22	9
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	96323
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		200
26A		CONTAINMENT		5
26B		DISTANCE TO POPULATION		20
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	100
27		LIKELIHOOD SCORE	LINES 25 + 26C	300
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	9.225
29	AIR - TARGETS	POPULATION - 4 MILES		1000
30		NEAREST RESIDENCE		10
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		5
34		TARGETS SCORE	SUM LINES 29 THRU 33	1025
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	2836688
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		50
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		20
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	400
38		LIKELIHOOD SCORE	LINES 36 + 37C	450
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	8.930
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		300
41		NEAREST RESIDENCE		10
42		RECREATIONAL USE		10
43		TARGETS SCORE	SUM LINES 40 THRU 42	320
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	1285920
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE	(LINES 10 + 24 + 35 + 44) / 100,000		81.62

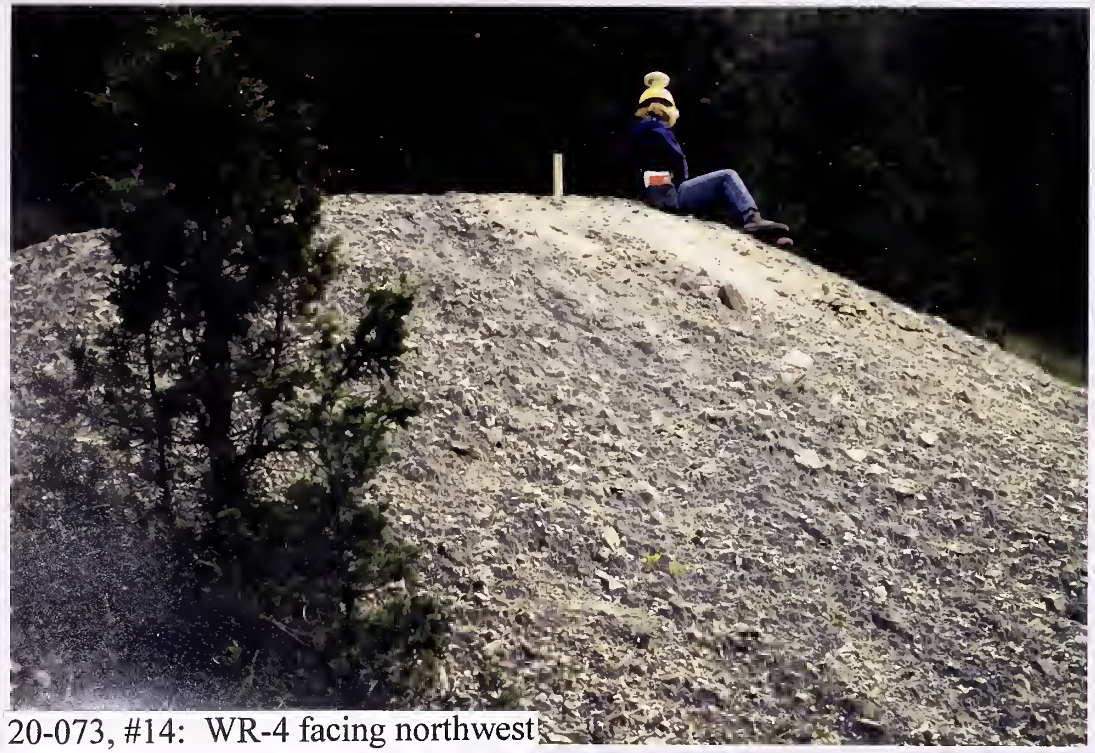
SITE NAME: Wenger #2
PA NUMBER: 20-073

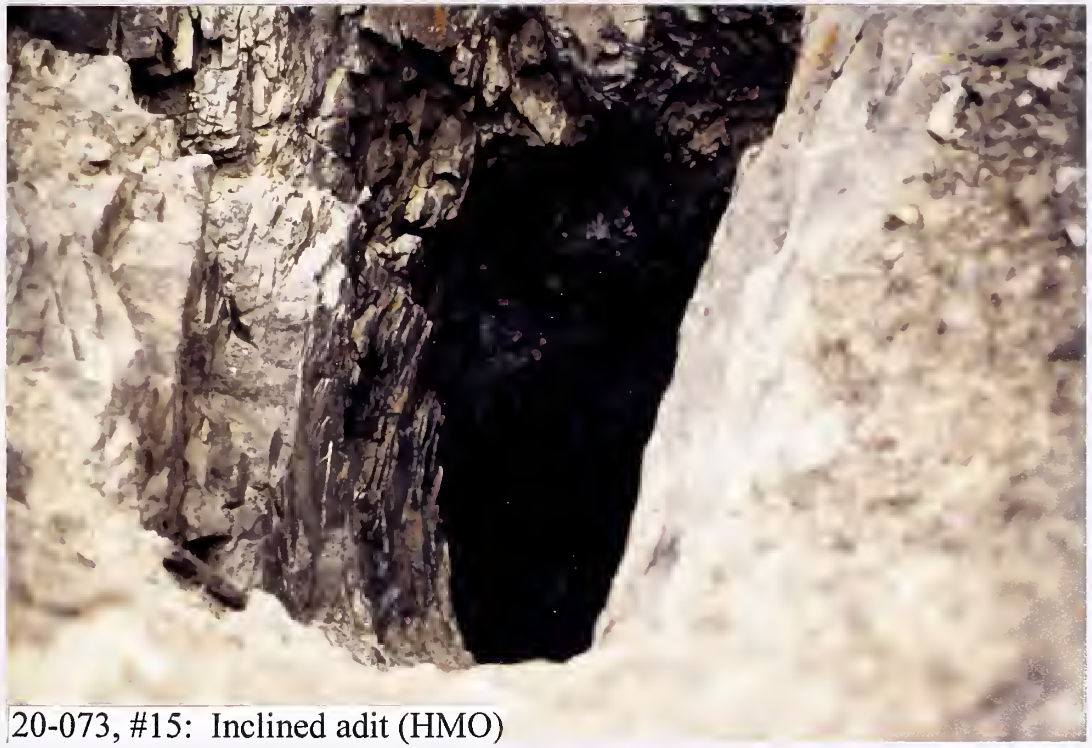
SITE SAFETY

LINE NO.				
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	100
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	80
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	180
9		POPULATION - 1 MILE		300
10	TARGETS	NEAREST RESIDENCE		10
11		RECREATIONAL USE		10
12		TARGETS SCORE	SUM LINES 9 THRU 11	320
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	1152.00


20-073, #12: TP-3A facing northeast toward TP-3B


20-073, #13: WR-3 facing northeast


20-073, #14: WR-4 facing northwest


20-073, #15: Inclined adit (HMO)

BASIN

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: JOSEPHINE **PA#:** 22-031

Date: August 2, 1994 **Time:** 0940-1600

Field Team Leader: Bisch, Pioneer

Sampling Personnel: Flammang, West; Pioneer

Visitors: Steve Tintle, Basin Creek Mining

Weather/Seasonality Observations: Partly cloudy; warm (70°-80°F); calm; very dry.

Photographic Log **(Film Roll and Photo No.'s/Video Tape Number):** #15: WR-6 facing west and hazardous loadout; #16: WR-3B (left foreground), WR-5 (left mid-ground), and WR-6 (right background) facing west; #17: Shaft #3 facing northwest, GW-1 sample location; #18: Shaft #2 and WR-2 facing north; #19: Collapsed Adit #1 with discharge facing west, AD-1 sample location; #20: WR-7 facing north (Note: Springs on either side of WR-7 with confluence at base). Video Tape No. 3

General Comments/Observations **(not covered specifically in attached Inventory Forms):** Site is located on Basin Creek Mine property. Permission and escort required to access site; must go through two locked gates.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Remove WR-1, WR-2, and WR-7 from Clear Creek floodplain and consolidate with WR-6; regrade, amend, and revegetate dumps. Possibly process wastes through Basin Creek Mill. Close HMOs. Note: Trash in shafts may increase the difficulty of proper closure.

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

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I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): JOSEPHINE **PA#:** 22-031

Legal Description: **T** 8N **;R** 6W **;Sec.** 26 **,** SE **1/4** NE **1/4** ___ **1/4**

County: JEFFERSON **Mining District:** BASIN

Latitude: N 46° 24' 58" **Longitude:** W 112° 18' 36"

Primary Drainage Basin and Code: Basin Creek/10020006
Secondary Drainage Basin: Clear Creek

USGS Quadrangle map name(s): Three Brothers

Mine Type/Commodities: Hardrock/Gold, Silver, Lead

Activity Status: **Active** ___ **,Inactive/Exploration** ___ **,Abandoned** X **.**

Ownership: Known Y X **N** ___ **; private/public?** Private
Owner, Agent, or Contact (Include address and phone when available)**:** Steve Tintle, Pegasus Gold, P.O. Box 180, Basin, MT 59631; (406) 494-5904.

Relationship to other mines/sites in the area/district: 11 miles north of Basin

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? Site is owned by Basin Creek Mining and possibly covered under their permit. Shafts #2 and #3 are fenced.

General site features: Elevation 7500' **, Slope** 20° **,**
Aspect Southeast

Land use: Mining X **, Recreational** ___ **, Residential** ___ **, Urban** ___ **,**
Agricultural ___ **, Other(Specify)** ___

Area of disturbed/unvegetated lands? Approx. 2 **acre(s).**
Site Dimensions: ___

Predominant vegetation types: Lodgepole pine, Douglas fir

Access: roads - good (paved) ___ **,poor (maintained dirt road)** ___ **,**
4wd X **,trail** ___ **.**
Other logistical considerations (proximity to other sites).
Located just north of Basin Creek Mine workings.

Well logs within 1 mile radius; **(Attach MBMG Well Log Printout(s):** There are 5 wells reported within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings **(Also note presence of radioactive minerals).** Site is underlain by Tertiary volcanics which are in turn underlain by quartz monzonite of the Boulder Batholith. Clear Creek begins its flow at WR-7; water flows south away from the site. Clear Creek flows into the operating Basin Creek Mine property.

Mining/milling history, ore type/tenor, host rock, gangue: Mine was discovered in 1887 and probably worked from 1893 intermittently until 1950. During that time, nearly 2,000 tons of ore was mined. Production from 1934 to 1953 yielded 1,489 tons of ore from which 330 oz. gold, 6,233 oz. silver, 616 lbs. copper, 1,887 lbs. lead and 1,293 lbs. zinc were recovered. All ore was produced from an oxidized zone in rhyolite. The vein apparently contained pyrite, galena, arsenopyrite, and chalcopyrite in a gangue of massive white quartz stained by abundant hematite and limonite.

Mine Operation?
Shafts - **Yes** X, **No** ___, **#** 5, **Comment** 3 collapsed; 2 w/water
Adits - **Yes** X, **No** ___, **#** 2, **Comment** Both caved; 1 w/discharge
Pits - **Yes** ___, **No** X, **#** ___, **Comment**
Placers - **Yes** ___, **No** X, **#** ___, **Comment**
Other - **Yes** ___, **No** X, **#** ___, **Comment**

Mill Operation? **Yes** ___, **No** X. **If yes answer the next three questions:**

Period(s) of Operation: N/A

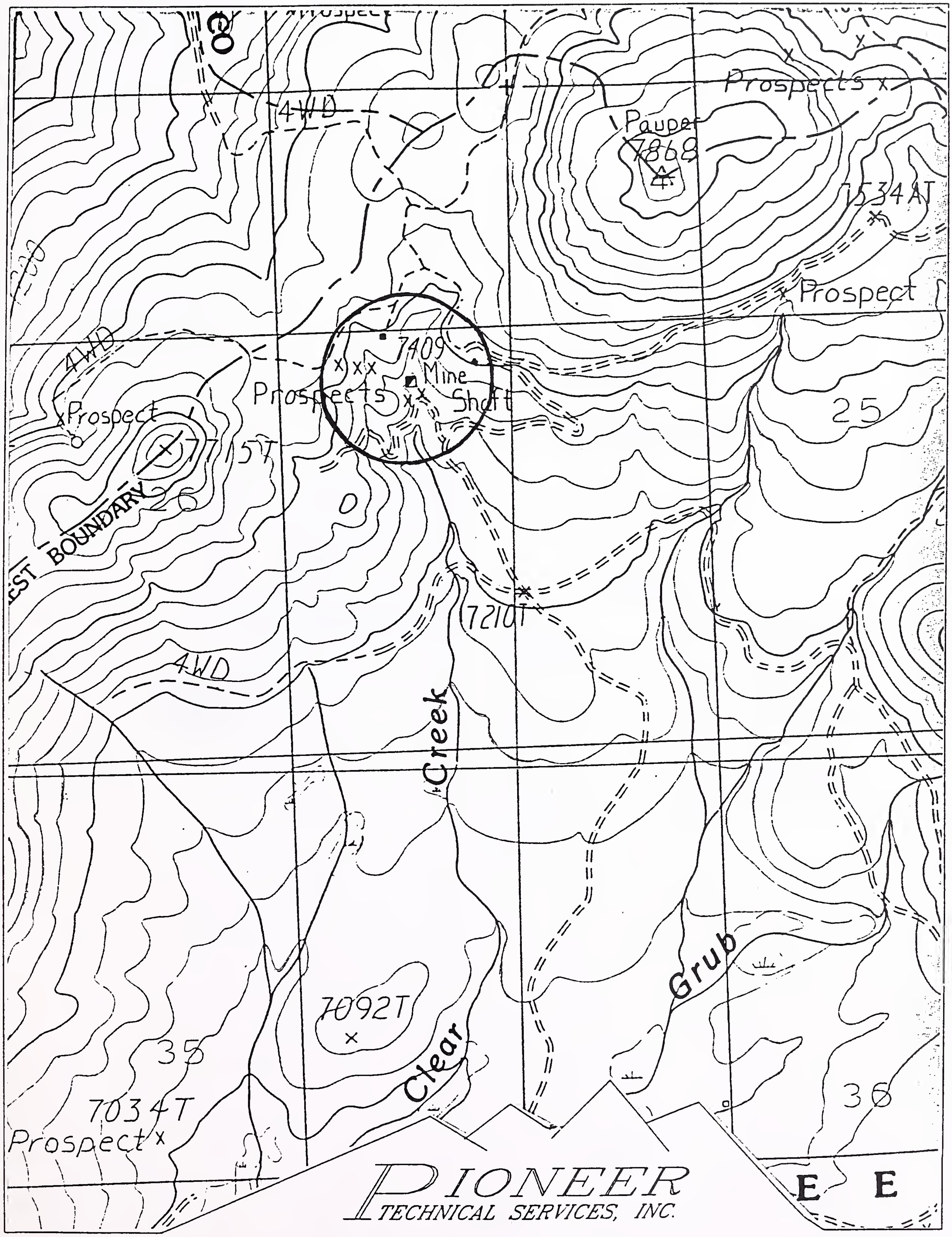
Origin of Ore Milled - Custom Mill ___ **Dedicated Mill** ___; **Number and names of mines that supplied mill feed:** N/A

Process? Hg-amalgam, CN^- leach (vat, heap), floatation, smelting?
N/A

Montana Bureau of Mines and Geology
Water Well Log Data

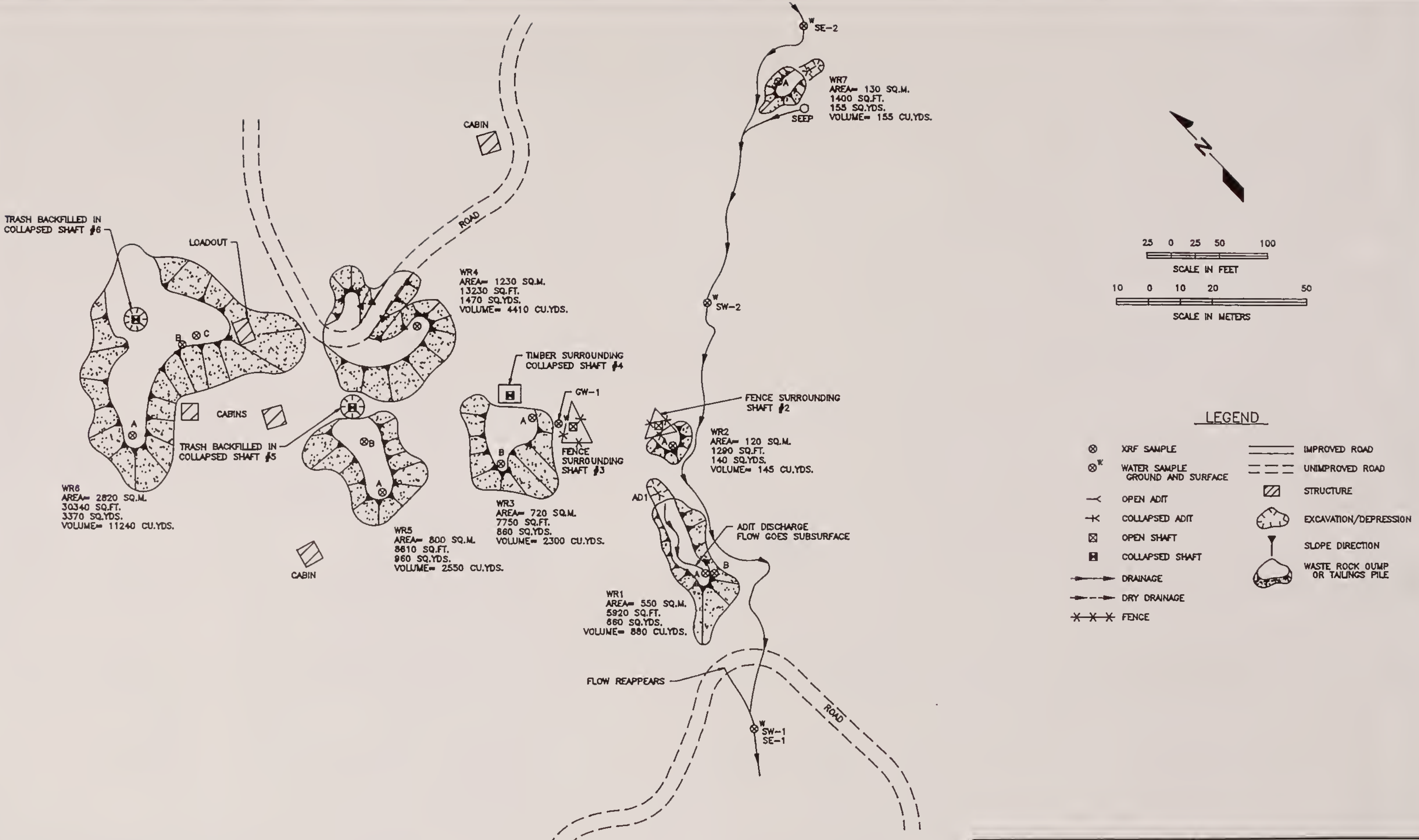
08/11/1994

Well No.	Location	Depth	Yield	Static Water Level
57350	08N 06W 25 CA	250.0	80.0	18.00
M:57349	08N 06W 25 CA	100.0	25.0	0.00
M:120003	08N 06W 25 CAC	210.0	15.0	11.00
M:121731	08N 06W 35	60.0	0.0	0.00
M:121730	08N 06W 35	59.0	0.0	0.00



PIONEER
TECHNICAL SERVICES, INC.

JOSEPHINE, P.A. NO. 22-031
T08N, R06W, SECTION 26
SCALE 1" = 1000'



DRAWN FOR:

PIONEER
TECHNICAL SERVICES, INC.

TITLE:

JOSEPHINE
PA# 22-031

DRAWING NO.: PT340222 REV: -
DATE: 11/15/94 PLOT SCALE: 1 = 30

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - *Use table on following page.*

Unique source identification: (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures/vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - *If tailings impoundments are also present, complete the following questions.*

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: Flammang, West

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1A	WR	880	Southeast section of WR-1; orange surface, silty clay	None	6.3 (D)	0.04	22-031-WR-1	08/02/94 1540	T-Metals, ABA
WR-1B	WR		Southeast section of WR-1; red surface with purple subsurface, silty sand	None	4.9 (D)	0.04			
WR-2A	WR	145	Top of WR-2; yellow surface with orange subsurface, clayey silt	None	6.0 (D)	0.04			
WR-3A	WR	2300	East end of south facing slope, near top, 10' east of loadout	None	5.6 (D)	0.05			
WR-3B	WR		Southeast end of east facing slope in yellow silt	None	4.25 (D)	0.055			
WR-4A	WR	4410	South end of WR-4; east end of pile in yellow material	None	4.1 (D)	0.07			
WR-5A	WR	2550	Southwest side of WR-5; off top of south end in white material	None	5.2 (D)	0.07			
WR-5B	WR		Northeast side of WR-5; on top of north end in pink material	None	5.95 (D)	0.07			
WR-6A	WR	11240	Uppermost waste rock; just off top of southern lobe on west end	None	6.0 (D)	0.08	22-031-WR-2	08/02/94 1515	T-Metals, ABA
WR-6B	WR		Near middle of WR-6; southwest of loadout approx. 25' in gray material	None	5.4 (D)	0.07			
WR-6C	WR		10' southwest of loadout in yellow material	None	3.6 (D)	0.09			
WR-7A	WR	155	Waste rock in Clear Creek; on top of southwest end	None	6.4 (D)	0.055			
SS-1	SOIL	N/A	Background soil on ridge above and west of WR-6	N/A	N/A	N/A	22-031-SS-1	08/02/94 1025	T-Metals

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-031-WR-1 is composite of WR-1A, -1B, -2A, -3A, -3B, -4A, -5A, -5B, and -7. 22-031-WR-2 is composite of WR-6A through -6C.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map

Flowing adits: Yes X , **No** ___, **Number:** 1 **Identification:** AD-1

Filled shafts: Yes X , **No** ____, **Number:** 2 **Identification:** Shaft #2, Shaft #3

Seeps/Springs: Yes X , **No** ____, **Number:** 2 **Identification:** Springs located at toe of WR-7 (east and west sides); headwaters of Clear Creek

Groundwater wells within 4 miles?: Yes X , **No**___;
Number of well logs: 11

Distance to nearest well used for drinking:
___**<1,000 ft;**___**1,000 ft to 0.5 miles;** X **>0.5 miles.**

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, **Probable**____, **Possible** X , **Unlikely**____.
Very shallow groundwater may be in contact with metal-bearing host rocks in shafts and adits and uncontained waste rock sources with elevated metal values; pH of water in discharging adit is low (4.16).

Approximate Depth to Groundwater: X **<25 ft;**___ **25 - 100 ft;**___ **>100 ft.**

Other observations/notes: Basin Creek Mining drinks bottled water although there is a well in place for the office 1/2 mile away. SWL in Shaft #3 approximately 30 to 40 feet higher than in Shaft #2, which is located approximately 100 feet away laterally. Water level in Shaft #2 is 10.4 feet bgs and in Shaft #3 it is 0.2 feet bgs.

GROUNDWATER INVENTORY FORM

SAMPLERS: Bisch, Flammang

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
AD-1	AD	Approx. 3' from where water emerges from collapsed adit on WR-1	1 gpm (E)	4.16	330	274.1	7.8	0	N/A	22-031-AD-1	08/02/94 1300	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
GW-1	SH	Standing water in Shaft #3	N/A	5.84	14.6	270.4	16.4	7	5	22-031-GW-1	08/02/94 1424	D-Metals, TDS, Hardness, SO4, NO2/NO3
GW-2	SH	Duplicate of GW-1	N/A	5.84	14.6	270.4	16.4	7	5	22-031-GW-2	08/02/94 1430	D-Metals, TDS, Hardness, SO4, NO2/NO3

*FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): GW-1 and GW-2 were filtered for D-Metals analysis per SOP.

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No ___, Name(s): Clear Creek

Dry streambeds: Yes ___, No X, Name(s): ___

Other surface water: Yes ___, No X, **Name(s)/Description:** ___

Waste materials within any floodplain: Yes X, No ___ **Source ID(s):** WR-1, WR-2, and WR-7

Approximate Flood frequency? X 1 yr, ___ 10 yr, ___ 100 yr

Estimated seasonal flow of stream(s) (cfs/gpm)? 25 gpm
High Flow: 150 gpm, **Average Flow:** 25 gpm

Distance between waste source(s) and nearest surface water body (ft)? 0 feet between WR-1, WR-2, and WR-7 and Clear Creek.

Surface water draining onto or through waste sources: Yes X, No ___, **Describe:** Adit discharge flows over WR-1. Clear Creek flows at toe of WR-1 and WR-2. Springs emerge at base of east and west sides of WR-7 to form Clear Creek.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?) Small wetland; water appears to run into Basin Creek Mine area.

Observed erosional/sedimentation/stream turbidity problems? Yes X, No ___. **Distance downstream (ft)?** 0-500 ___; 500-1,000 X; >1,000 ___. **Describe/explain** (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Fine-grained waste rock noticeable in streambed for several hundred feet downstream from site. Silt fence located in stream approx. 700 feet downstream from site where stream flows near Basin Creek Mine workings.

SURFACE WATER INVENTORY FORM

SAMPLERS: Bisch

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	150' downstream from WR-1 in Clear Creek	7.08	35	16.2	4	25 gpm (E)	22-031-SW-1	08/02/94 1240	T-Metals, TDS, Hardness, SO4, NO2/NO3
SE-1	SE	150' downstream from WR-1 in Clear Creek	N/A	N/A	N/A	N/A	N/A	22-031-SE-1	08/02/94 1240	T-Metals
SW-2	SW	Sample from Clear Creek between WR-7 and WR-2	7.57	17.6	12.9	11	20 gpm (E)	22-031-SW-2	08/02/94 1255	T-Metals, TDS, Hardness, SO4, NO2/NO3
SE-2	SE	Dry sediment sample collected upstream from WR-7 in Clear Creek	N/A	N/A	N/A	N/A	N/A	22-031-SE-2	08/02/94 1330	T-Metals
SE-500	SE	500' downstream from SE-1 in Clear Creek	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): No flow in Clear Creek above WR-7.

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides? (SO$_3$)

Presence of evaporative salt deposits? (ESD)

Discolored or turbid seepage? (SPG)

Presence of long filamentous algae in drainages, mosses in moist areas?

Presence of ferric hydroxide precipitates? (FEOX)

Presence of burned or stressed vegetation? (VEG)

pH ≤ 5.0 (pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? Possibly 0.5 acre below WR-1 in drainage

Wetlands present: Yes___, No X , Describe: No classic wetlands present, but Clear Creek is quite boggy in places.

Carbonate rocks/soils: Yes___, No X , Describe:

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30 X ; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments

Nearest residence:___<1,000 ft;___1,000 ft - 0.5 miles; X >0.5 miles.

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Flammang, West

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
WR-1	pH	Partially Moist	5,920	5,920	No	Low
WR-2	None	Partially Moist	1,290	1,290	Yes	Moderate
WR-3	Moderate SO3; pH	Dry	7,750	7,750	Yes	Low
WR-4	Abundant SO3; pH	Dry	13,230	13,230	Yes	Low
WR-5	Abundant SO3	Dry	8,610	8,610	Yes	Low
WR-6	Abundant SO3; pH	Dry	30,340	30,340	Yes	Low
WR-7	None	Dry	1,400	1,330	Yes	Low
AD-1	pH; Algae	N/A	N/A	N/A	N/A	N/A

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes_____, No_X__
Describe:____________________

Population within 1 mile: 1-10_X_; 10-30___; 30-100___; 100-300___; 300-1,000____; 1,000-3,000____; 3,000-10,000____; 10,000 or greater____;
Comments____________________

Evidence of recreational use on site: Yes___, No_X_, Describe: Locked gate limits access to site.

Accessibility (check each that apply):___Easily accessible - no fences, gates, or warning signs;___Moderately Accessible - barbed wire fences, road gated, or signs posted;_X_Difficult Access - chain-link fence, road gated and locked, site guarded (does not include locked or manned access points located more than 0.5 miles from the actual site).

Sensitive environments on-site or adjacent to site:

State or National Parks -	**Yes___,**	**No_X_,**	**Comment**__________	
Wilderness Area -	**Yes___,**	**No_X_,**	**Comment**__________	
T&E Species Habitat -	**Yes___,**	**No_X_,**	**Comment**__________	
Bat Habitat -	**Yes___,**	**No_X_,**	**Comment**__________	

Primary Drainage___; Secondary Drainage_X_; No Information___:

Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium_X_, Low___
Fisheries Habitat and Species Classification - _4_
Sport Fishery Classification - _4_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, No___, Number_2__, types and locations: Shafts #2 and #3 are open, but fenced. Both shafts contain water; maximum depth of Shaft #3 may be only 5 feet.

Hazardous structures: Yes_X_, No___, Number_4__, types and locations: Cabin at WR-6; loadout; cabin at WR-5; collapsing cabin at WR-4.

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number_2__, types and locations: Collapsed shaft on WR-3, walls caving; 18 feet deep; Shaft #2, upper walls appear to be sloughing.

Unstable waste piles, impoundments, undercut banks: Yes_X_, No____, Number_4___, types and locations: WR-3, -4, -5, and -6 are steep, unvegetated, and at angle of repose.

Fire and/or Explosion hazards: Yes___, No_X_, Explain:____________________

Bibliography

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MBMG, Well Log Database, July 14, 1994.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Lands National Inventory, Phase II Problem Area Data Sheet for Josephine, Prepared by Daphne Digrindakis, September 2, 1982.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Josephine, Prepared by Northern Engineering and Testing, August 9, 1988.

Strasburger, E.J., Report on the Josephine Mine, October 18, 1948.

USGS, Topographic Map, Three Brothers, Montana, 7 1/2 minute Quadrangle, 1985.

LABORATORY ANALYTICAL DATA

JOSEPHINE
PA NO. 22-031

Josephine PA# 22-031
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BISCH
INVESTIGATION DATE: 08/02/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-031-SE1	3.4	82.2 J	13.3 J	0.9 UJ	1.8 UJ	1.5 UJ	41.9	4470 JX	0.17 JX	20.3 J	3.1 U	465	11.3 UJ	45.9	NR
22-031-SE2	1.1 U	32.2 J	63.3 J	1.0 UJ	2.5 J	1.7 UJ	11.4	3990 JX	0.09 JX	418 J	3.5 U	72.4	12.5 UJ	53.5	NR
22-031-WR1	30.8	225 J	19.7 J	0.7 UJ	1.4 UJ	1.2 UJ	75.4	8960 JX	0.70 JX	66.4 J	2.5 U	3000	8.9 UJ	46.4	NR
22-031-WR2	64.7	1960 J	17.0 J	0.7 UJ	1.4 UJ	1.1 UJ	106	7020 JX	0.50 JX	1.7 J	2.4 U	10600	23.0 J	68.0	NR
BACKGROUND	1.0 U	84.1 J	67.8 J	1.0 UJ	2.5 J	2.5 J	55.9	7500 JX	0.24 JX	442 J	3.5 U	53.3	12.5 UJ	57.6	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-031-WR1	0.10	3.12	-0.70	-3.8	0.10	<0.01	0.01	0.00	-0.70
22-031-WR2	0.38	11.9	-3.30	-15	0.26	0.03	0.09	0.94	-4.24

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-031-AD1	2.55	15.3	11.4	10.4	8.4 U	6.8 U	295	446	0.10	259	14.4 U	554 J	51.6 U	1430	48.4
22-031-GW1	0.28	7.1	5.5 U	4.0 U	8.4 U	6.8 U	5.9 U	898	0.08 U	48.1	14.4 U	22.8 J	51.6 U	15.6 U	2.8
22-031-GW2	0.26	7.5	5.5 U	4.0 U	8.4 U	6.8 U	5.9 U	1050	0.08 U	57.7	14.4 U	23.4 J	51.6 U	27.2	3.0
22-031-SW1	0.72	7.8	5.5 U	4.0 U	8.4 U	6.8 U	13.7	241	0.13	20.8	14.4 U	39.8 J	51.6 U	84.1	8.7
22-031-SW2	0.21	3.5	5.5 U	4.0 U	8.4 U	6.8 U	5.9 U	32.1	0.11	2.3 U	14.4 U	2.0 J	51.6 U	15.6 U	4.2

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-031-AD1	68	<5.0	66	<0.05	NR
22-031-GW1	13	<5.0	10	<0.05	NR
22-031-GW2	<4.0	<5.0	10	<0.05	NR
22-031-SW1	40	<5.0	10	0.23	NR
22-031-SW2	<4.0	<5.0	<5.0	0.09	NR

LEGEND

SE1 - 150' downstream from WR1 in Clear Creek.
SE2 - Dry sediment sample collected upstream from WR7 and WR2.
WR1 - Composite of subsamples WR1A, 1B, 2A, 3A, 3B, 4A, 5A, 5B, and 7.
WR2 - Composite of subsamples WR6A through 6C.
BACKGROUND - From the Josephine Mine (22-031-SS1).

AD1 - Approx. 3' from where water emerges from collapsed adit on WR1.
GW1 - Standing water in shaft #3.
GW2 - Duplicate of GW1.
SW1 - Same as sample 22-031-SE1.
SW2 - Sample from Clear Creek between WR7 and WR2.

XRF ANALYSIS RESULTS

JOSEPHINE
PA NO. 22-031

Mine Name: Josephine PA# 22-031
XRF Field Analyses
Results In PPM

XRF SAMPLE I.D.	CrHI	K	Ca	TI	CrLO	Mn	Fe	Co	NI	Cu	Zn	As	Sr
22-031-SE500		18242.6	1687.79	352.312 *			9788.02		135.168 *		161.359 *	101.717 *	78.1145
22-031-WR1A		45028	1958.16	561.833 *			29417.7				255.075 *	120.071 *	56.0943
22-031-WR1B		36279.7	1743.49	1051.25			41469.3				187.691 *		69.5855
22-031-WR1B-DUP		36177.7	1624.44	1102.19			41628.5				215.961 *		69.8155
22-031-WR1-COMP		35705.3	1987.21	946.7			24929.1				205.746 *	209.265 *	156.108
22-031-WR2A		42554.2	1752.5	1328.7			23958.2				371.092	113.424 *	109.669
22-031-WR2-COMP		37747	1691.84	867.258			19330.9		141.014 *		232.235 *	2315.26	103.66
22-031-WR3A		39237.1	2135.4	1288.04			25596.9				281.09		41.9215
22-031-WR3B		27669.2	1512.69	1534.73			12921.8				267.274	113.625 *	338.318
22-031-WR4A		36926.6	1349.37	731.197 *			21658.3				178.651 *	340.058 *	246.44
22-031-WR5A		32209.5	2820.24	1086.45			16127.9				113.478 *	297.197 *	246.175
22-031-WR5B		26305.3	3984.46	825.215	247.744 *		23240.3				247.302 *		326.193
22-031-WR6A		28366.2	1341.34	653.521 *			20488.6				240.026 *	1257.15	115.116
22-031-WR6B		35071.8	1571.59	1070.71			14660.9				92.6606 *	2857.79	49.2384
22-031-WR6C		29930	1562.51	269.64 *			24897.6			176.953 *	136.934 *	5246.16	126.695
22-031-WR7		32922.5	1682.05	319.264 *			9321.96				133.855 *	52.4538 *	13.2528 *

XRF SAMPLE I.D.	Zr	Hg	Mo	Pb	Rb	Cd	Sn	Sb	Ba	Ag	U	Th
22-031-SE500	150.126			340.928	213.357				240.974		45.3978 *	21.9711 *
22-031-WR1A	140.456			360.87	288.079				563.072			
22-031-WR1B	168.365		14.8787	2443.54	275.397			131.958	329.119	159.392 *		38.7596 *
22-031-WR1B-DUP	157.349			2535.39	278.755			125.445 *	298.031	143.597 *		35.6253 *
22-031-WR1-COMP	147.481			1646.51	266.957			58.7199 *	474.388			29.0064 *
22-031-WR2A	168.832			420.208	357.338				763.002			
22-031-WR2-COMP	125.068			4190.55	240.074			87.5481 *	446.575			
22-031-WR3A	180.838			1870.22	250.483			57.1723 *	404.536			
22-031-WR3B	189.493		8.37787 *	570.857	223.665				791.562			
22-031-WR4A	141.339		19.7843 *	5636.58	272.712				315.116	167.916 *		36.3181 *
22-031-WR5A	138.297			1912.57	189.717				369.142	91.139 *		21.4099 *
22-031-WR5B	136.032			1801.99	193.643			49.3758 *	501.913			33.4761 *
22-031-WR6A	139.693			1110.86	260.563				680.685			
22-031-WR6B	133.103			3323.31	238.386				218.392			
22-031-WR6C	105.557		21.9481 *	9720.82	215.821			129.7 *	128.72 *	125.622 *		
22-031-WR7	185.661				350.044						83.4196 *	54.4037

* = Estimated Quantity

$ = Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

JOSEPHINE
PA NO. 22-031

AIMSS SCORESHEET

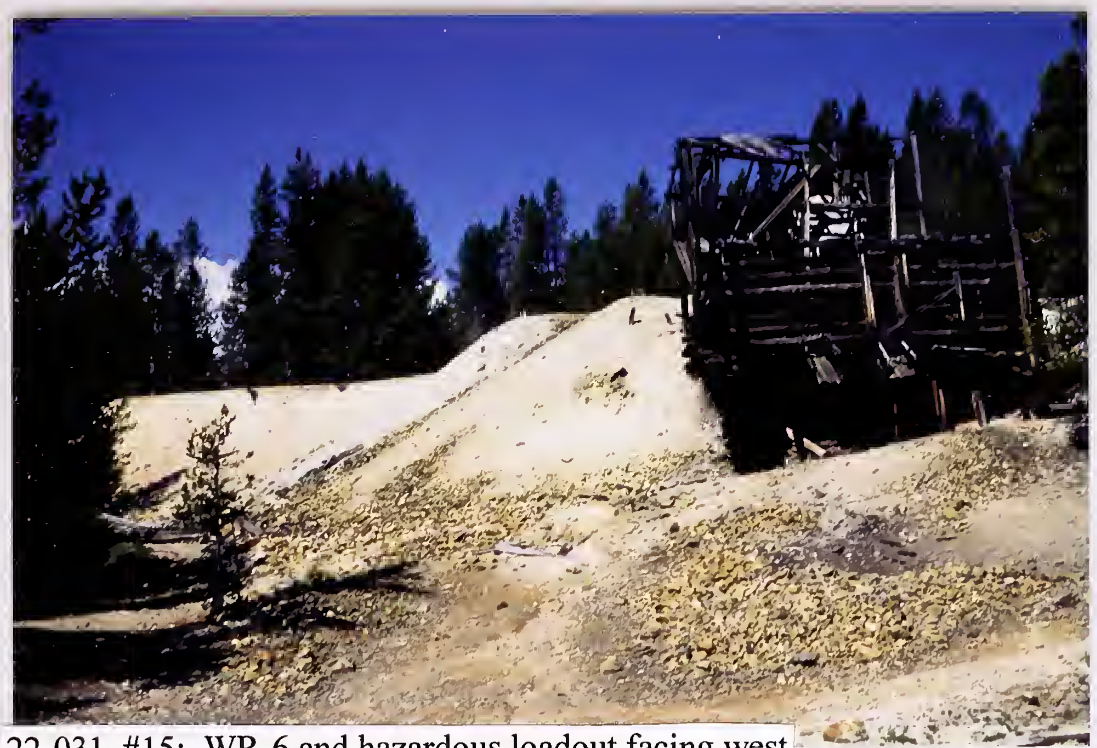
SITE NAME: Josephine
PA NUMBER: 22-031

LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	155.875
6	GW - TARGETS	WELLS - 1 MI. x 2.5		12.5
7		WELLS - 1 TO 4 MI		6
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	18.5
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	1153475
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		300
12		EXCEEDENCES		50
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	750
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	170.423
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		1
18		WETLANDS		10
19		FISHERY		1
20		RECREATION		0
21		IRRIGATION/STOCK		0
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	12
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	1533807
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		5
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	25
27		LIKELIHOOD SCORE	LINES 25 + 26C	25
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.697
29	AIR - TARGETS	POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	20
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	849
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		0
37A		ACCESSIBILITY		5
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	25
38		LIKELIHOOD SCORE	LINES 36 + 37C	25
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.552
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		1
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 THRU 42	1
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	39
45	TOTAL SITE HUMAN &	ENVIRONMENTAL HAZARD SCORE (LINES 10 + 24 + 35 + 44) / 100,000		26.88

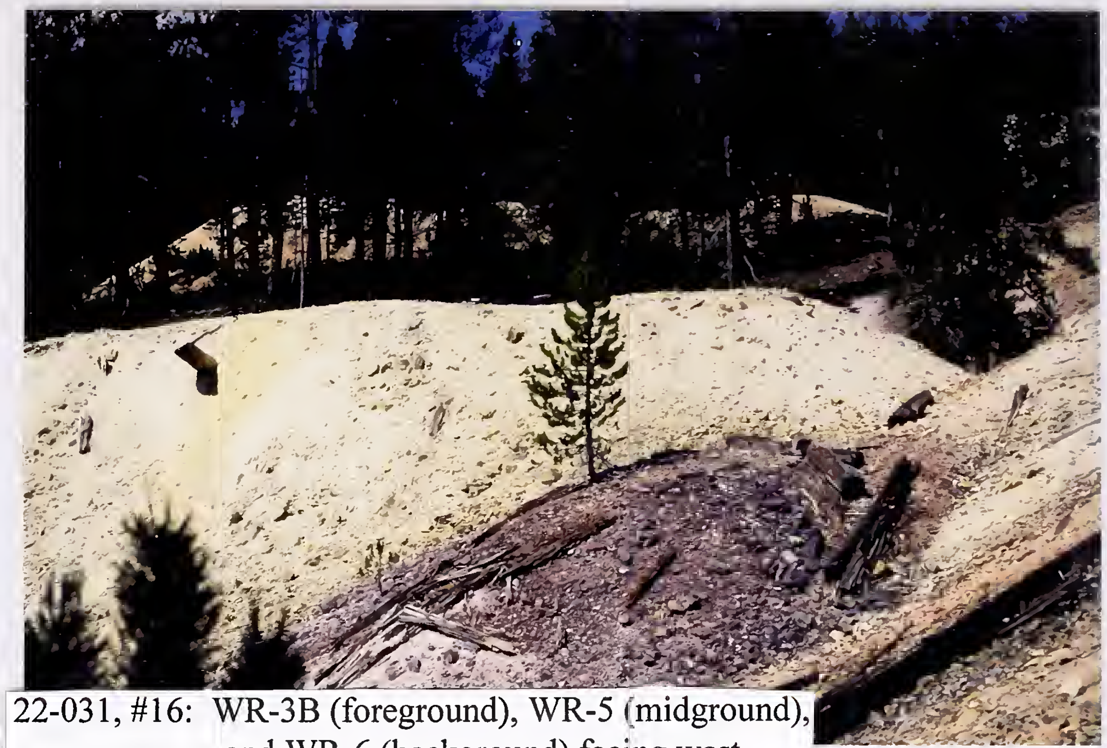
SITE NAME: Josephine
PA NUMBER: 22-031

SITE SAFETY

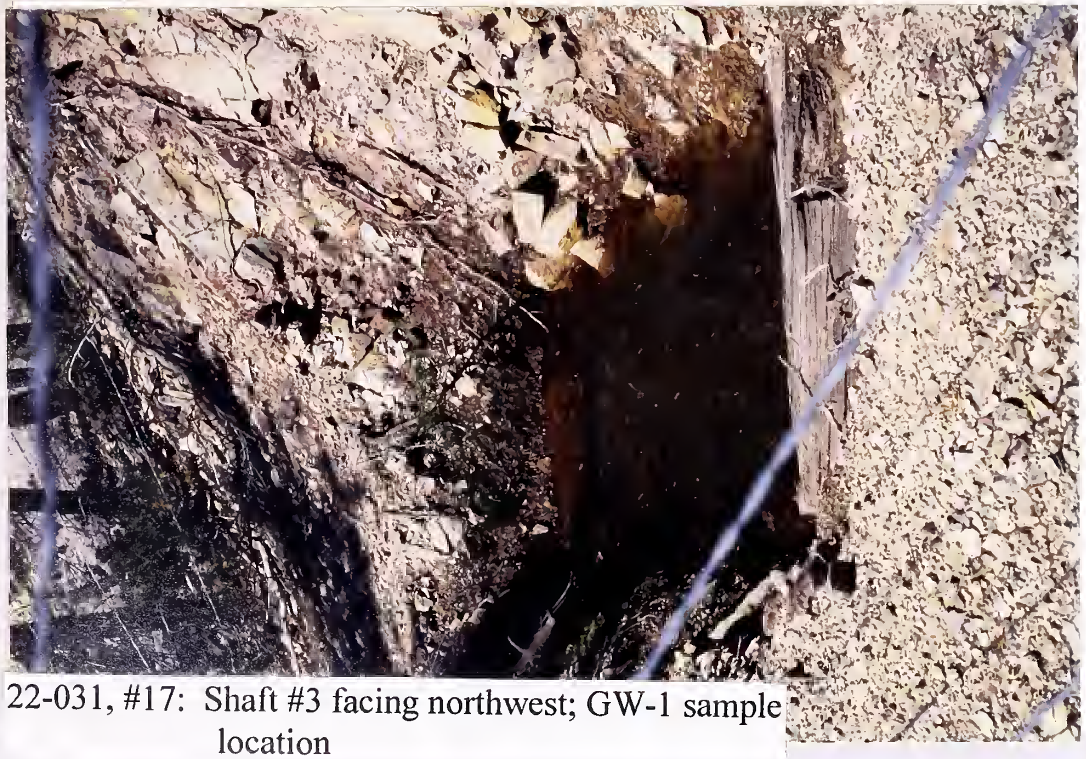
LINE NO.				
1	THREAT	ACCESSIBILITY		5
2		OPEN SHAFTS	100 EA.	200
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	150
5		HAZ. STRUCTURES	40 EA.	160
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	510
9		POPULATION - 1 MILE		1
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 THRU 11	1
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	2.55



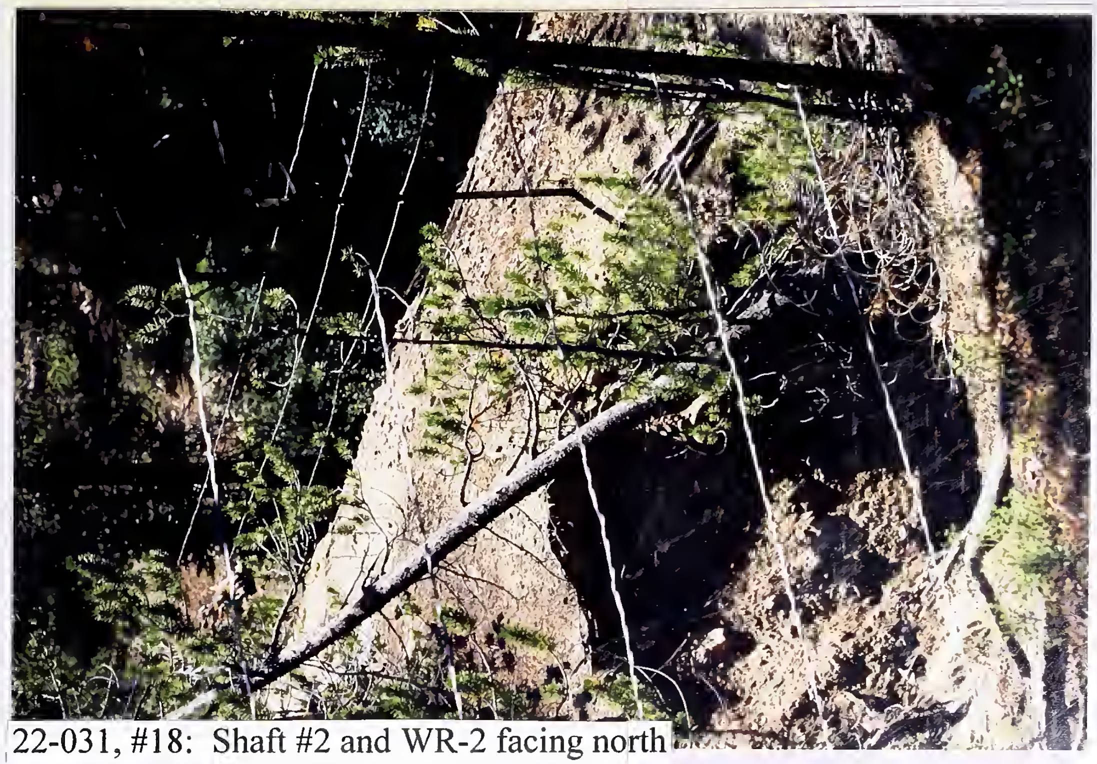
22-031, #15: WR-6 and hazardous loadout facing west



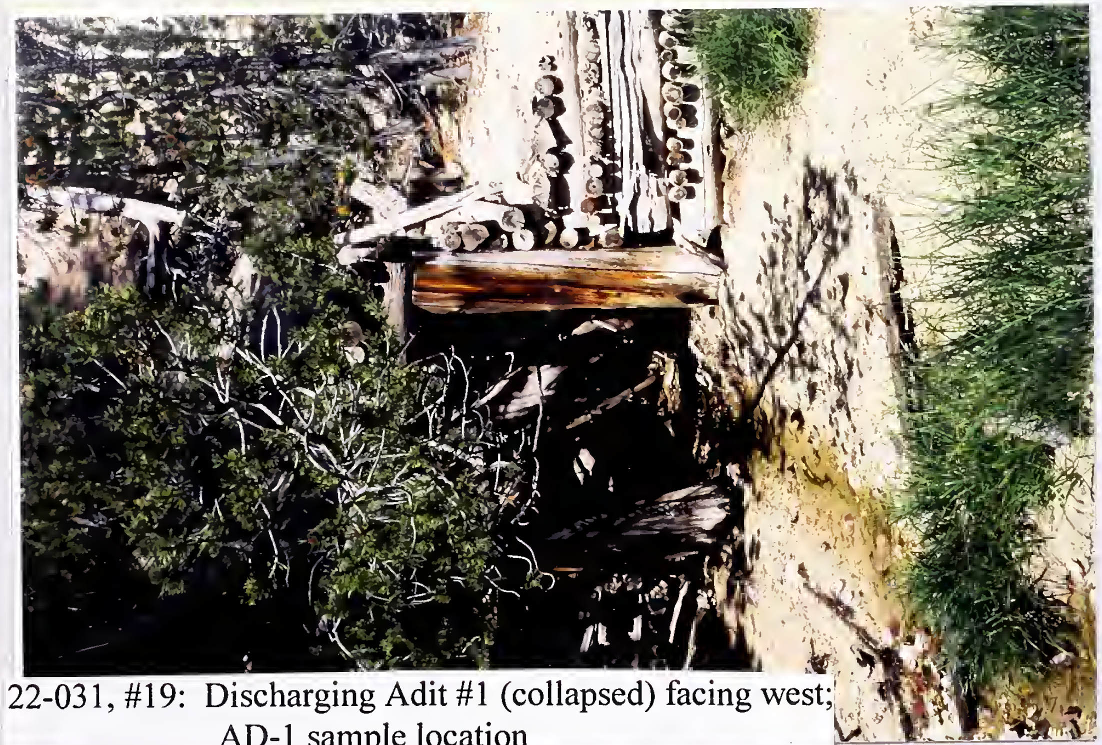
22-031, #16: WR-3B (foreground), WR-5 (midground), and WR-6 (background) facing west

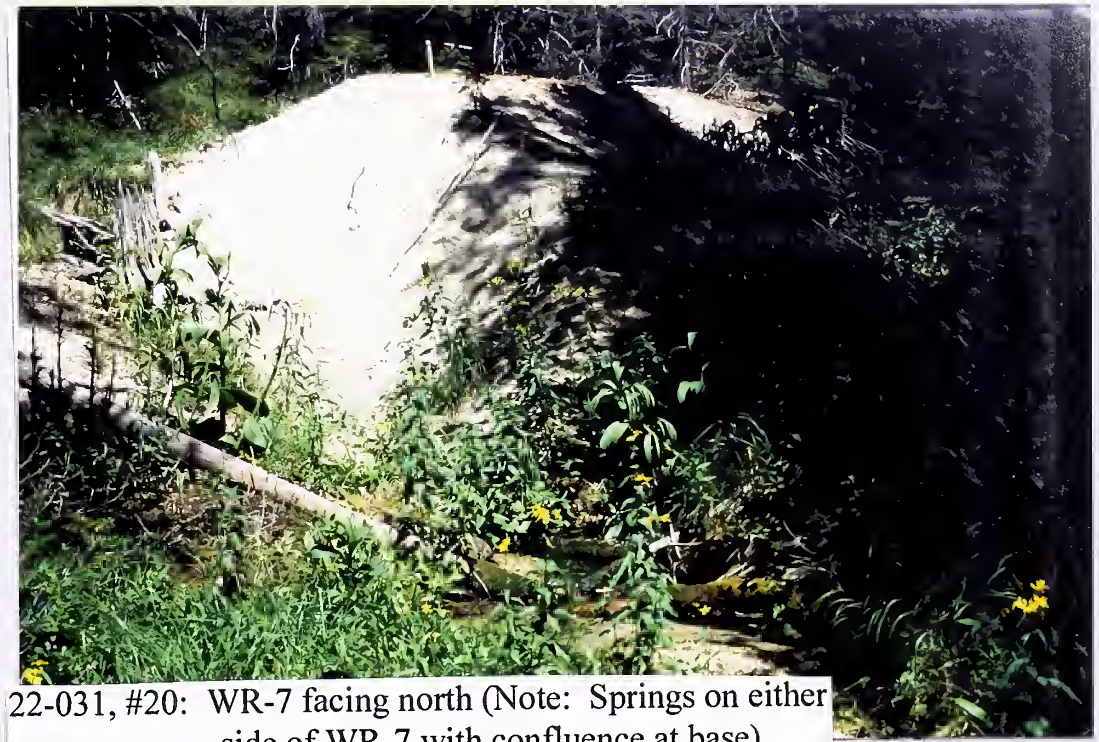


22-031, #17: Shaft #3 facing northwest; GW-1 sample location



22-031, #18: Shaft #2 and WR-2 facing north


22-031, #19: Discharging Adit #1 (collapsed) facing west; AD-1 sample location


22-031, #20: WR-7 facing north (Note: Springs on either side of WR-7 with confluence at base)

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: DORIS **PA#:** 22-293

Date: June 17, 1994 **Time:** 0845-1145

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Bisch, Clark, West; Pioneer

Visitors: None

Weather/Seasonality Observations: Sunny and warm (50° to 60°F); slight breeze from the southeast.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number)**:** #5: Adit #1 (HMO); #6: Adit #2 (HMO); #7: WR-1, facing down at Basin Creek; #8: WR-1 and loadout; #9: Trench below loadout, directly above Adit #3; #10: WR-1 and Basin creek; #11: Adit #3; #12: WR-2.
Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms)**:** No vehicular access to the site; must cross Basin Creek by foot from main Basin Creek Road.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Remove or isolate dumps from Basin Creek floodplain, regrade in flat area northwest of site, and revegetate. Close HMOs.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): DORIS **PA#:** 22-293

Legal Description: **T** 6N **;R** 5W **;Sec.** 7 **,** SW **1/4** SE **1/4** ____ **1/4**

County: JEFFERSON **Mining District:** BASIN

Latitude: N 46° 66' 58" **Longitude:** W 112° 16' 30"

Primary Drainage Basin and Code: Basin Creek/10020006
Secondary Drainage Basin: Basin Creek

USGS Quadrangle map name(s): Basin

Mine Type/Commodities: Hardrock/Unknown

Activity Status: Active ___ **,Inactive/Exploration** ___ **,Abandoned** X **.**

Ownership: Known Y ___ **N** X **; private/public?** Private
Owner, Agent, or Contact (Include address and phone when available)**:** Unknown

Relationship to other mines/sites in the area/district: North of Basin <1 mile; several patented mines in the immediate area.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? N/A

General site features: Elevation 5400' **, Slope** 15°-20° **,**
Aspect Northeast

Land use: Mining ___ **, Recreational** X **, Residential** ___ **, Urban** ___ **,**
Agricultural ___ **, Other(Specify)** ___

Area of disturbed/unvegetated lands? 0.7 **acre(s).**
Site Dimensions: 400 feet x 400 feet

Predominant vegetation types: Douglas Fir, Quaking Aspen, willow, cottonwood, juniper, alder

Access: roads - good (paved) ___ **,poor (maintained dirt road)** X **,**
4wd ___ **,trail** ___ **.**
Other logistical considerations (proximity to other sites). Must cross creek by foot to access the site.

Well logs within 1 mile radius; (Attach MBMG Well Log Printout(s): There are 16 wells reported within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Rocks exposed in the Basin district are principally Cretaceous and Tertiary volcanic rocks and granitic rocks of the Boulder Batholith. Site lies on the west side of Basin Creek, which flows southeast away from the site. Basin Creek flows into the Boulder River approximately 1.5 miles downstream.

Mining/milling history, ore type/tenor, host rock, gangue: No information available.

Mine Operation?
Shafts - **Yes**___, **No** X, **#** ___, **Comment**
Adits - **Yes** X, **No**___, **#** 3, **Comment** 1 caved; 1 open; 1 w/door
Pits - **Yes**___, **No** X, **#** ___, **Comment**
Placers - **Yes**___, **No** X, **#** ___, **Comment**
Other - **Yes**___, **No** X, **#** ___, **Comment**

Mill Operation? **Yes**___, **No** X. **If yes answer the next three questions:**

Period(s) of Operation: N/A

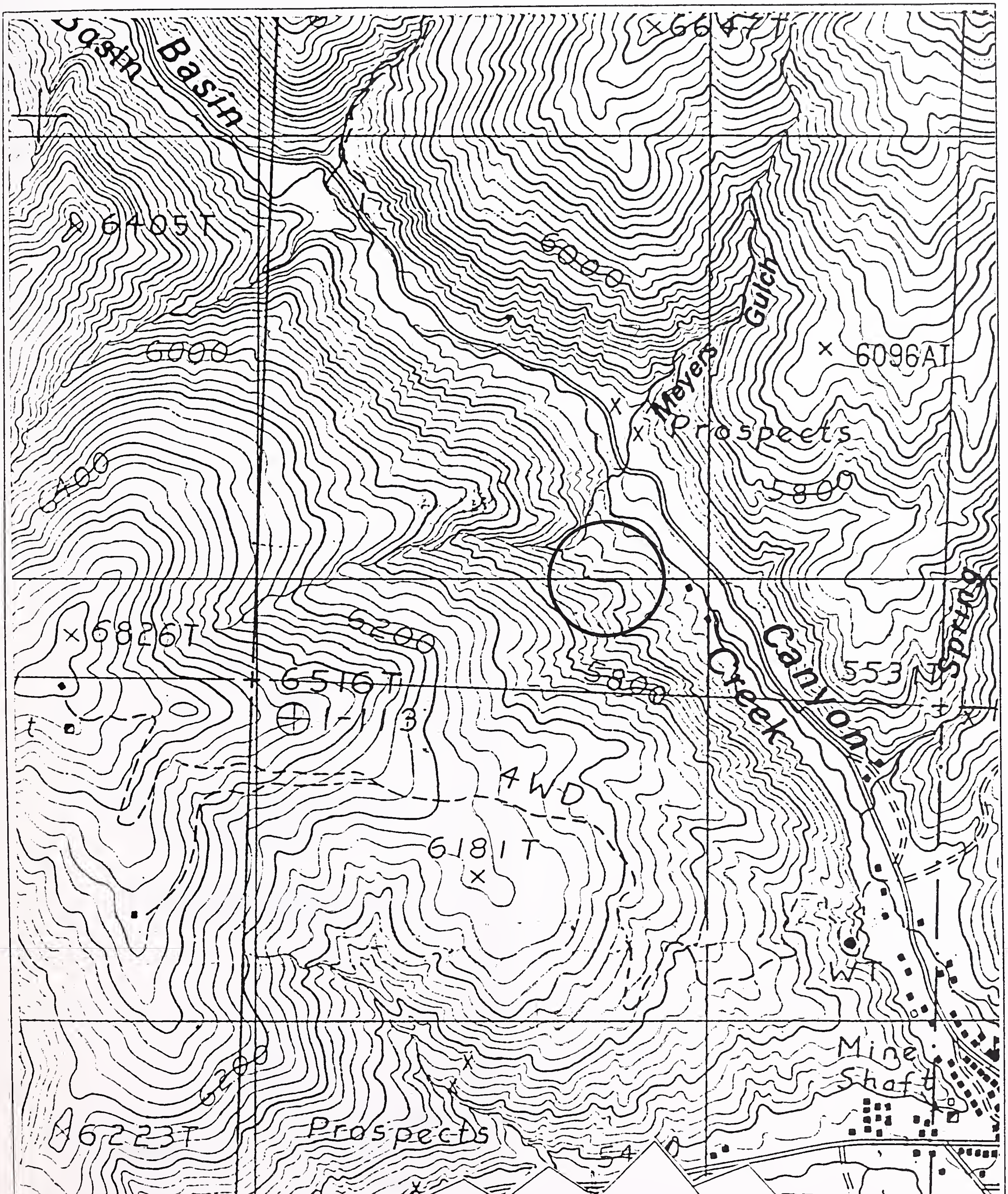
Origin of Ore Milled - Custom Mill___ **Dedicated Mill**___; **Number and names of mines that supplied mill feed:** N/A

Process? Hg-amalgam, CN$^-$ leach (vat, heap), floatation, smelting?
N/A

Montana Bureau of Mines and Geology
Water Well Log Data

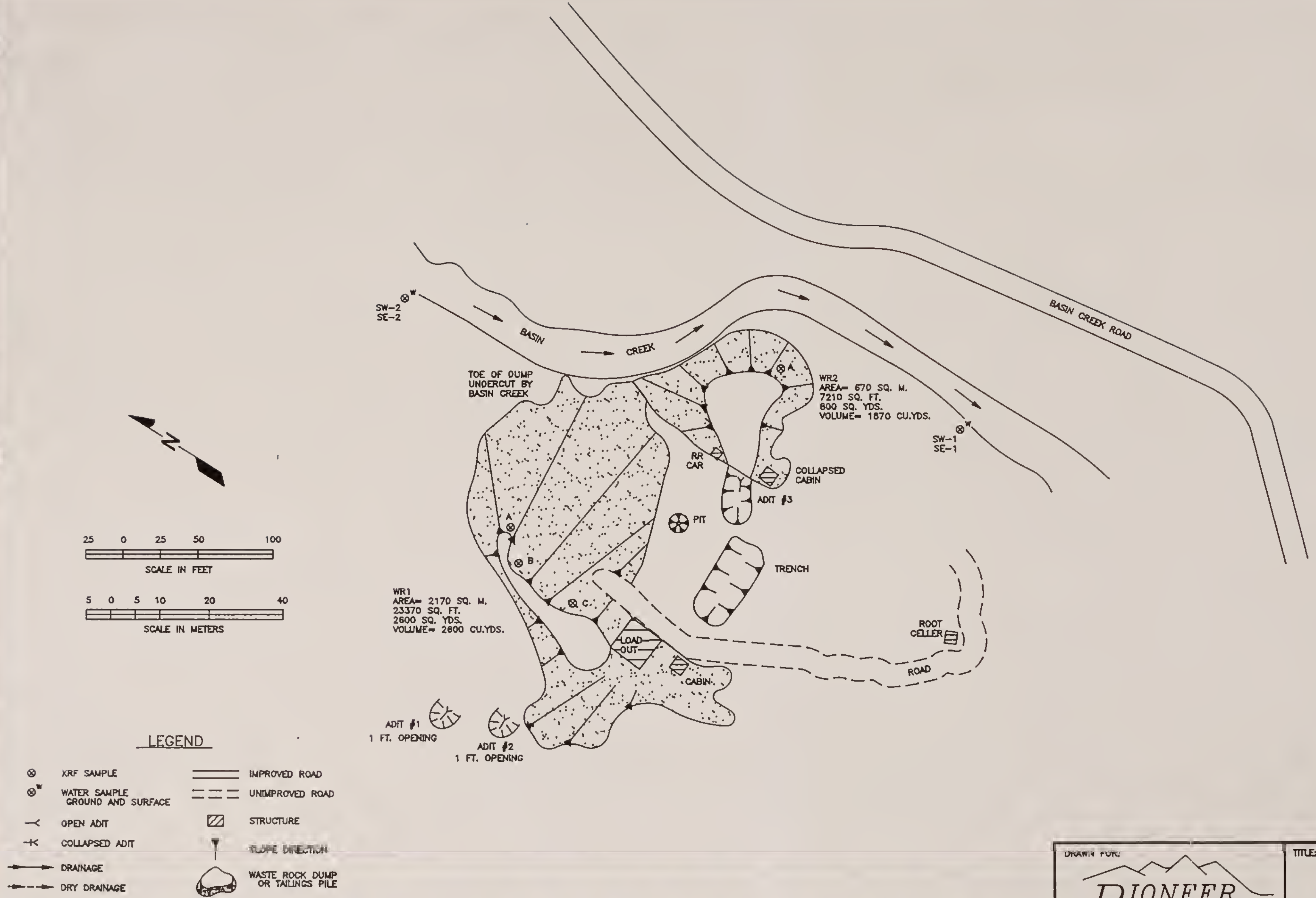
08/11/1994

Well No.	Location	Depth	Yield	Static Water Level
M:53420	06N 05W 07 DCB	25.0	30.0	10.00
M:135002	06N 05W 17 ACA	397.0	9.0	36.00
M:53427	06N 05W 17 CB	0.0	2.0	15.00
M:131806	06N 05W 17 CBA	31.0	20.0	16.00
M:53426	06N 05W 17 CCB	30.0	500.0	4.00
M:53429	06N 05W 18	27.0	60.0	14.00
M:53432	06N 05W 18	30.0	30.0	10.00
M:53433	06N 05W 18	16.0	20.0	0.00
M:53431	06N 05W 18	21.0	20.0	5.00
M:53434	06N 05W 18	40.0	20.0	38.00
M:53430	06N 05W 18	25.0	65.0	25.00
M:138495	06N 05W 18 ACB	50.0	150.0	21.44
M:138497	06N 05W 18 ACB	51.0	150.0	21.90
M:53435	06N 05W 18 ADA	100.0	200.0	17.00
M:132795	06N 05W 18 DAD	45.0	125.0	20.00
M:53445	06N 06W 13 DD	90.0	12.0	65.00



PIONEER
TECHNICAL SERVICES, INC.

DORIS, P.A. NO. 22-293
T06N, R05W, SECTION 07
SCALE: 1" = 1000'



DRAWN FOR:

PIONEER
TECHNICAL SERVICES, INC.

TITLE:

DORIS
PA# 22-293

DRAWING NO.: PT340211 REV: –
DATE: 11/29/94 PLOT SCALE: 1 = 20

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - *Use table on following page.*

Unique source identification: (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures/vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - *If tailings impoundments are also present, complete the following questions.*

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: Bisch, West

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1A	WR	2,600	West lobe of large dump; charcoal colored sand under orange oxidized layer (3' deep), sulfur odor	None	4.0 (D)	0.05	22-293-WR-1	06/17/94 1000	T-Metals, ABA
WR-1B	WR		West lobe of dump, near center; gray/yellow coarse sand/gravel	None	< 3.5 (D)	0.07			
WR-1C	WR		Lower east lobe of dump; orange sand	None	< 3.5 (D)	0.06			
WR-2	WR	1,870	Small dump 75% revegetated with trees and brush (toe of dump in Basin Creek floodplain); brown sand	None	3.8 (D)	0.06	22-293-WR-2	06/17/94 1000	T-Metals ABA

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-293-WR-1 is composite of WR-1A through -1C. 22-293-WR-2 is grab of WR-2. There are many dead trees where WR-1 has sloughed down slope; WR-1 is extremely steep. See Josephine (22-031) for background soil sample.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No_X_, Number:____ Identification:______________

Filled shafts: Yes___, No_X_, Number:____ Identification:______________

Seeps/Springs: Yes___, No_X_, Number:____ Identification:______________

Groundwater wells within 4 miles?: Yes_X_, No___;
Number of well logs:_34___

Distance to nearest well used for drinking:
___<1,000 ft;___1,000 ft to 0.5 miles;_X_>0.5 miles.

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable____, Possible_X__, Unlikely____.
Snowmelt and rainfall could percolate through reactive material and cause metals migration.

Approximate Depth to Groundwater:_X_<25 ft;___ 25 - 100 ft;___ >100 ft.

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

SAMPLERS:__________

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.												

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):__________

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No ___, Name(s): Basin Creek

Dry streambeds: Yes ___, No X, Name(s): ___

Other surface water: Yes ___, No X, **Name(s)/Description:** ___

Waste materials within any floodplain: Yes X, No ___ **Source ID(s):** WR-1 and WR-2 are in floodplain.

Approximate Flood frequency? ___ 1 yr, X 10 yr, ___ 100 yr

Estimated seasonal flow of stream(s) (cfs/gpm)? 40 cfs
High Flow: 350 cfs, **Average Flow:** 35 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes X, No ___,
Describe: Basin Creek cuts into toe of WR-1.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Basin Creek, as well as the Boulder River, has irrigation, stock watering, fishery, and wetlands.

Observed erosional/sedimentation/stream turbidity problems? Yes X, No ___. **Distance downstream (ft)?** 0-500 X; 500-1,000 ___; >1,000 ___.
Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Oxidized waste material in floodplain.

SURFACE WATER INVENTORY FORM

SAMPLERS: Bullock

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	Downstream in Basin Creek	6.94	99.5	5.8	4	42.5 cfs (M)	22-293-SW-1	06/17/94 1030	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-1	SE	Downstream in Basin Creek	N/A	N/A	N/A	N/A	N/A	22-293-SE-1	06/17/94 1030	T-Metals
SW-2	SW	Upstream in Basin Creek	8.03	98.8	5.8	17	42.5 cfs (M)	22-293-SW-2	06/17/94 1045	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-2	SE	Upstream in Basin Creek	N/A	N/A	N/A	N/A	N/A	22-293-SE-2	06/17/94 1045	T-Metals
SE-100	SE	Composite of floodplain material on north side of Basin Creek, approx. 100' downstream from WR-2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): SE-500 and SE-1000 were not collected due to abundant other sources contributing to sediment load.

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides? *(SO_3)*

Presence of evaporative salt deposits? *(ESD)*

Discolored or turbid seepage? *(SPG)*

Presence of long filamentous algae in drainages, mosses in moist areas?

Presence of ferric hydroxide precipitates? *(FEOX)*

Presence of burned or stressed vegetation? *(VEG)*

$pH \leq 5.0$ *(pH)*

General Potential for AMD Mitigation:

Area available for treatment (acres)? None

Wetlands present: Yes___, No X, Describe:___

Carbonate rocks/soils: Yes___, No X, Describe:___

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30___; 30-100___; 100-300 X; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments Site is located <1 mile from the town of Basin.

Nearest residence:___<1,000 ft;___1,000 ft - 0.5 miles; X >0.5 miles.

For each source (table next page):

Available fine materials? *Surface area?*

Uncovered and unvegetated? *Wet or dry?*

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Bisch, West

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
WR-1	Abundant SO3; FEOX; pH; VEG	Partially moist	23,370	23,370	Yes	Low
WR-2	pH	Partially moist	7,210	1,800	No	None

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes_____, No_X_, Describe:________________________________

Population within 1 mile: 1-10___; 10-30_X_; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments________________________________

Evidence of recreational use on site: Yes_X_, No___, Describe:_Litter

Accessibility (check each that apply):_X_**Easily accessible - no fences, gates, or warning signs;**___**Moderately Accessible - barbed wire fences, road gated, or signs posted;**___**Difficult Access - chain-link fence, road gated and locked, site guarded (does not include locked or manned access points located more than 0.5 miles from the actual site).**

Sensitive environments on-site or adjacent to site:
State or National Parks - Yes___, No_X_, Comment________________
Wilderness Area - Yes___, No_X_, Comment________________
T&E Species Habitat - Yes___, No_X_, Comment________________
Bat Habitat - Yes___, No_X_, Comment________________

Primary Drainage_X_; Secondary Drainage___; No Information___:
Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium___, Low_X_
Fisheries Habitat and Species Classification - _4_
Sport Fishery Classification - _4_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, No___, Number_2__, types and locations:___
Adit #1 and Adit #2

Hazardous structures: Yes_X_, No___, Number_1__, types and locations:_
Loadout structure is collapsing (low hazard potential).

Unstable highwalls, pits, trenches, slopes: Yes_X_, No___, Number_1__, types and locations:_Trench directly above Adit #3

Unstable waste piles, impoundments, undercut banks: Yes_X_, No____, Number_1__, types and locations:_WR-1 is extremely steep and is being undercut by Basin Creek.

Fire and/or Explosion hazards: Yes___, No_X_, Explain:________________________________

Bibliography

MBMG, Well Log Database, July 14, 1994.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Doris, Prepared by Northern Engineering and Testing, July 27, 1988.

USGS, Topographic Map, Basin, Montana, 7 1/2 minute Quadrangle, 1985.

LABORATORY ANALYTICAL DATA

DORIS
PA NO. 22-293

Doris PA# 22-293
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BULLOCK
INVESTIGATION DATE: 06/17/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-293-SE1	0.7	45.9 JX	37.2	2.5 JX	6.5	3.5 J	161 J	9170 J	0.07 J	608 JX	3.9	89.3 JX	6.6 UJ	284	NR
22-293-SE2	0.6 U	74.5 JX	48.7	3.3 JX	7.5	0.9 UJ	27.3 J	5410 J	0.06 J	937 JX	2.5	67.1 JX	5.9 UJ	292	NR
22-293-WR1	17	44.4 JX	9.68	11.9 JX	4.7	3.2 J	531 J	18800 J	3.33 J	527 JX	5.5	2000 JX	5.8 J	1570	NR
22-293-WR2	0.6 U	5.7 UJX	7.84	2.4 JX	10.4	4.9 J	82.2 J	22100 J	0.07 J	2410 JX	8.4	182 JX	6.3 UJ	722	NR
BACKGROUND	1.0 U	84.1 J	67.8 J	1.0 UJ	2.5	2.5 J	55.9	7500 JX	0.24 JX	442 J	3.5 U	53.3	12.5 UJ	57.6	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-293-WR1	0.93	29.1	2.93	-26	0.61	0.05	0.27	1.56	1.36
22-293-WR2	0.27	8.43	13.6	5.20	<0.01	0.07	2.19	2.19	11.4

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-293-SW1	0.13 JX	13.0	19.4	2.6 U	8.7 U	4.7 U	11.2	390	0.14	29.8	8.0 U	2.9	29.4 U	91.1	24.1
22-293-SW2	0.22 JX	13.7	18.9	2.6 U	8.7 U	4.7 U	11.8	404	0.12	32.7	8.0 U	3.0	29.4 U	98.7	23.5

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-293-SW1	53	<5	9.0	0.06	NR
22-293-SW2	64	<5	7.0	0.06	NR

LEGEND

SE1 - Downstream in Basin Creek.
SE2 - Upstream in Basin Creek.
WR1 - Composite of subsamples WR1A through 1C.
WR2 - Grab sample of the WR2 subsample.
BACKGROUND - From the Josephine Mine (22-031-SS1).

SW1 - Same as sample 22-293-SE1.
SW2 - Same as sample 22-293-SE2.

XRF ANALYSIS RESULTS

DORIS
PA NO. 22-293

Mine Name: Doris PA# 22-293
XRF Field Analyses
Results In PPM

XRF SAMPLE I.D.	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Ni	Cu	Zn	As	Sr
22-293-SE100		19888.4	7274.21	1260.86		1409.45 *	19047.4				274.547		284.974
22-293-WR1A		17044.6	28481.9	1336.67		3590.61	20497.4			716.934	5654.42		379.715
22-293-WR1B		35474.7	1511.6	1127.71		5276.48	20068.4			456.336	577.806		43.9098 *
22-293-WR1C		24805	13521.4	1240.9		676.961 *	35957.4			214.988 *	635.248		87.8277
22-293-WR1-COMP		23243.1	14102.9	1019.52		1516.59 *	24482.1			449.21	2152.39		144.043
22-293-WR2		13959.1	10738.6	2156.19		5259.12	31956.7				493.931		238.195

XRF SAMPLE I.D.	Zr	Hg	Mo	Pb	Rb	Cd	Sn	Sb	Ba	Ag	U	Th
22-293-SE100	203.502			116.521 *	139.8				562.7			15.2818 *
22-293-WR1A	134.769			49.0517 *	157.124				522.434			17.4896 *
22-293-WR1B	127.564		12.6214 *	3493.28	276.612				73.265 *	82.7755 *		31.4822 *
22-293-WR1C	170.605		23.4553 *	1262.89	255.063				298.397			
22-293-WR1-COMP	150.025		13.2664 *	1396.89	190.423				261.838			
22-293-WR2	200.656			38.8945 *	174.942				541.449			12.5863 *

* = Estimated Quantity

$ = Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

DORIS
PA NO. 22-293

MDSL AMRB/PIONEER 5/16/94

AIMSS SCORESHEET

SITE NAME: Doris
PA NUMBER: 22-293

LINE NO.				
		GROUNDWATER PATHWAY		
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	2.096
6		WELLS - 1 MI. x 2.5		40.0
7	GW - TARGETS	WELLS - 1 TO 4 MI		18
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	58.0
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	48627
		SURFACE WATER PATHWAY		
11		OBSERVED RELEASE		300
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	700
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	2.360
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19	SW - TARGETS	FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	18
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	29736
		AIR PATHWAY		
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		5
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	25
27		LIKELIHOOD SCORE	LINES 25 + 26C	25
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.221
29		POPULATION - 4 MILES		100
30		NEAREST RESIDENCE		0
31	AIR - TARGETS	WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	100
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	553
		DIRECT CONTACT PATHWAY		
36		OBSERVED EXPOSURE		50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	150
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.198
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		10
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		2
43		TARGETS SCORE	SUM LINES 40 THRU 42	12
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	356
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE	(LINES 10 + 24 + 35 + 44) / 100,000		0.79

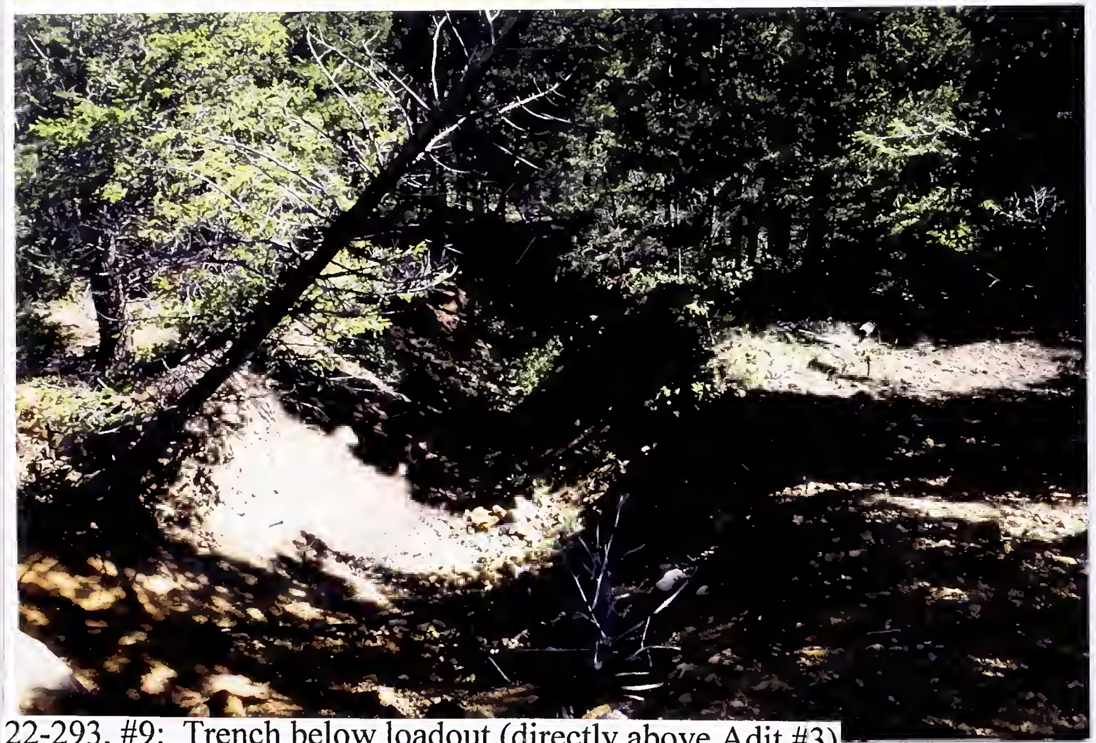
			SITE NAME:	Doris
			PA NUMBER:	22-293
LINE NO.		SITE SAFETY		
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	100
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	75
5		HAZ. STRUCTURES	40 EA.	40
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	215
9		POPULATION - 1 MILE		10
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		2
12		TARGETS SCORE	SUM LINES 9 THRU 11	12
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	51.60

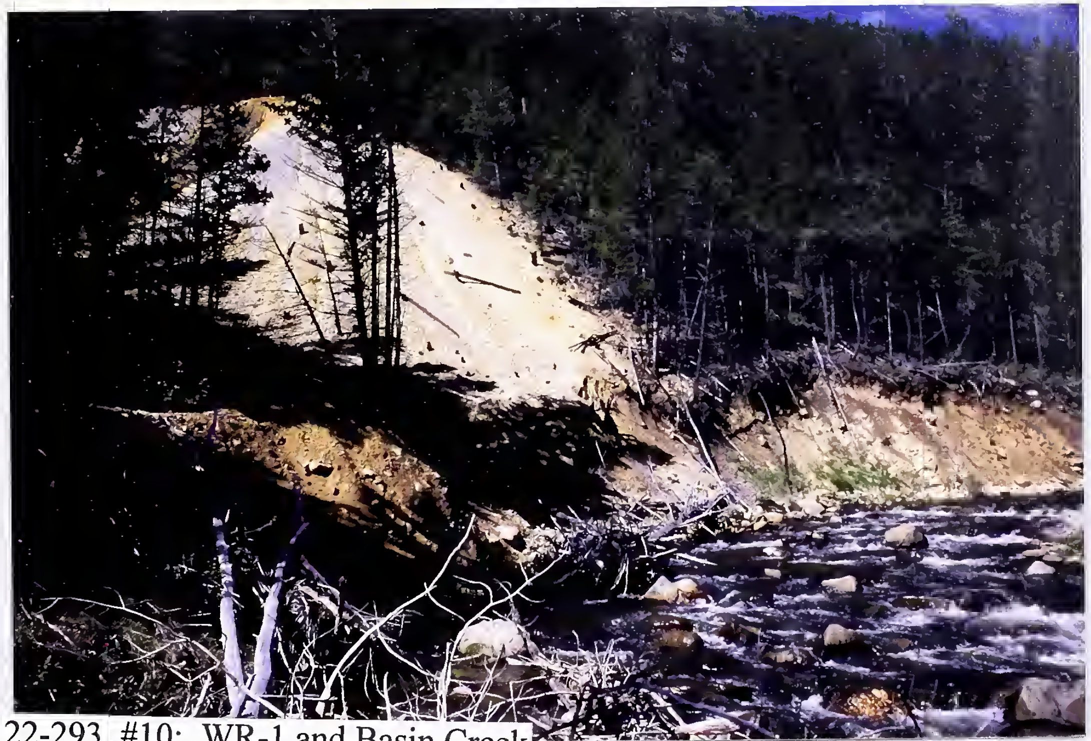
22-293, #5: Adit #1 (HMO)

22-293, #6: Adit #2 (HMO)

22-293, #7: WR-1 facing down at Basin Creek

22-293, #8: WR-1 and loadout


22-293, #9: Trench below loadout (directly above Adit #3)


22-293, #10: WR-1 and Basin Creek

22-293, #11: Adit #3

22-293, #12: WR-2

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: LADY LEITH **PA#:** 22-316

Date: June 15, 1994 **Time:** 1200-1700

Field Team Leader: Bisch, Pioneer

Sampling Personnel: Clark, West; Pioneer

Visitors: None

Weather/Seasonality Observations: Partly cloudy; cool (approx. 50°F); breezy; intermittent snow.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #13: SW-1 sample location, upgradient; #14: Adit #1; #15: WR-1; #16: Collapsed Shaft #1; #17: Collapsed Shaft #2; #18: SW-2 sample location; #19: WR-3; #20: Shaft #2 and WR-5; #21: WR-4; #22: WR-6 and Adit #4 in background. Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms): Access to site is very difficult; roads in poor condition. Various workings located below the site (exploratory trenches); small trenches and vegetated dumps with no water associated. Site is believed to be the Lady Leith Mine (originally 22-502) based on identical site sketches compared to NE NW S6 (22-316).

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Remove or isolate WR-1 and WR-3 from floodplain, consolidate in flat area northwest of site, and contour and revegetate dumps.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): LADY LEITH **PA#:** 22-316

Legal Description: **T** 7N **;R** 5W **;Sec.** 6 **,** NE **1/4** NW **1/4** ____ **1/4**

County: JEFFERSON **Mining District:** BASIN

Latitude: N 46° 23' 28" **Longitude:** W 112° 16' 48"

Primary Drainage Basin and Code: Basin Creek/10020006
Secondary Drainage Basin: Basin Creek

USGS Quadrangle map name(s): Three Brothers

Mine Type/Commodities: Hardrock/Lead, Zinc

Activity Status: **Active** ____**,Inactive/Exploration** ____**,Abandoned** X .

Ownership: Known Y ____ **N** X **; private/public?** Private/Public
Owner, Agent, or Contact (Include address and phone when available)**:** Unknown

Relationship to other mines/sites in the area/district: Unknown

Regulatory Status (Activity by other agencies)? Hardrock permits?
Past Reclamation Activities? N/A

General site features: Elevation 7520'**, Slope** 10°-20°**,**
Aspect Northwest

Land use: Mining ____**, Recreational** X **, Residential** ____**, Urban** ____**,**
Agricultural ____**, Other(Specify)** ____

Area of disturbed/unvegetated lands? 7 **acre(s).**
Site Dimensions: 800 feet x 400 feet

Predominant vegetation types: Very heavily timbered Lodgepole pine and Douglas fir; some Engelmann spruce throughout the entire site.

Access: roads - good (paved) ____**,poor (maintained dirt road)** ____**,**
4wd ____**,trail** X **.**
Other logistical considerations (proximity to other sites).
Possible 4wd access to site during dry conditions.

Well logs within 1 mile radius; **(Attach MBMG Well Log Printout(s):** There are 3 wells reported within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings **(Also note presence of radioactive minerals).** Site lies in headwaters of Basin Creek on north and south sides of an unnamed tributary to Basin Creek. The tributary flows north one mile to confluence with Basin Creek, then west in Basin Creek. Site is underlain by altered quartz monzonite.

Mining/milling history, ore type/tenor, host rock, gangue: The mine was worked sporadically from 1890 to 1911, but there is no reported production. A sample of vein material from a dump contained 0.182 oz./ton gold, 11.4 oz./ton silver, 0.42% copper, 3% lead, and 0.2% zinc. Vein mineralization containing pyrite, galena, chalcopyrite, sphalerite, chalcocite, siderite, and barite in a gangue of quartz. Host rock is altered quartz monzonite.

Mine Operation?

Shafts - **Yes** X, **No** ___, **#** 2, **Comment** 1 caved; 1 fenced

Adits - **Yes** X, **No** ___, **#** 5, **Comment** All caved; 2 discharging

Pits - **Yes** ___, **No** X, **#** ___, **Comment** ___

Placers - **Yes** ___, **No** X, **#** ___, **Comment** ___

Other - **Yes** X, **No** ___, **#** Many, **Comment** Exploration trenches

Mill Operation? **Yes** ___, **No** X. **If yes answer the next three questions:**

Period(s) of Operation: N/A

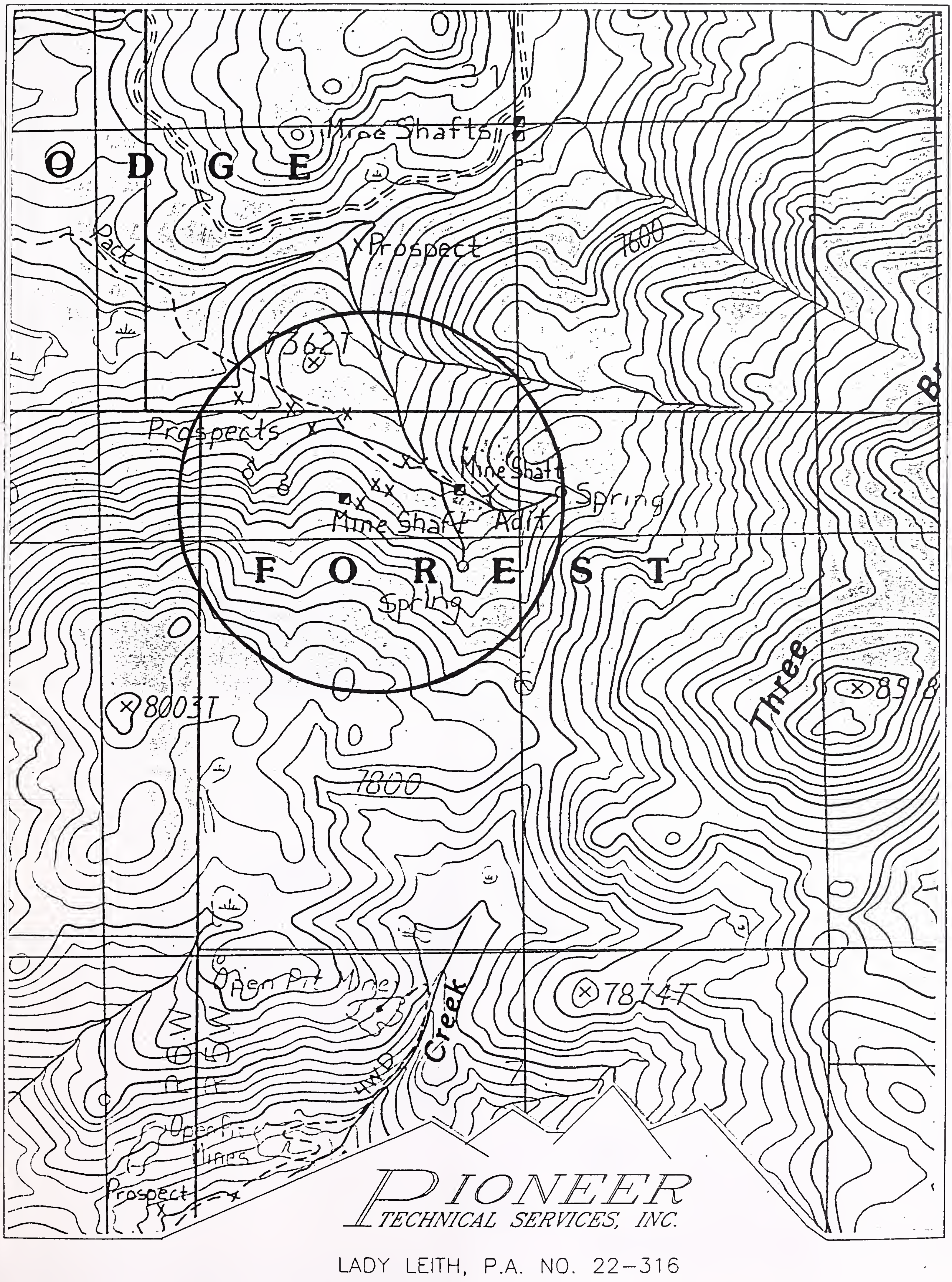
Origin of Ore Milled - Custom Mill ___ **Dedicated Mill** ___; **Number and names of mines that supplied mill feed:** N/A

Process? Hg-amalgam, CN^- leach (vat, heap), floatation, smelting?
N/A

Montana Bureau of Mines and Geology
Water Well Log Data

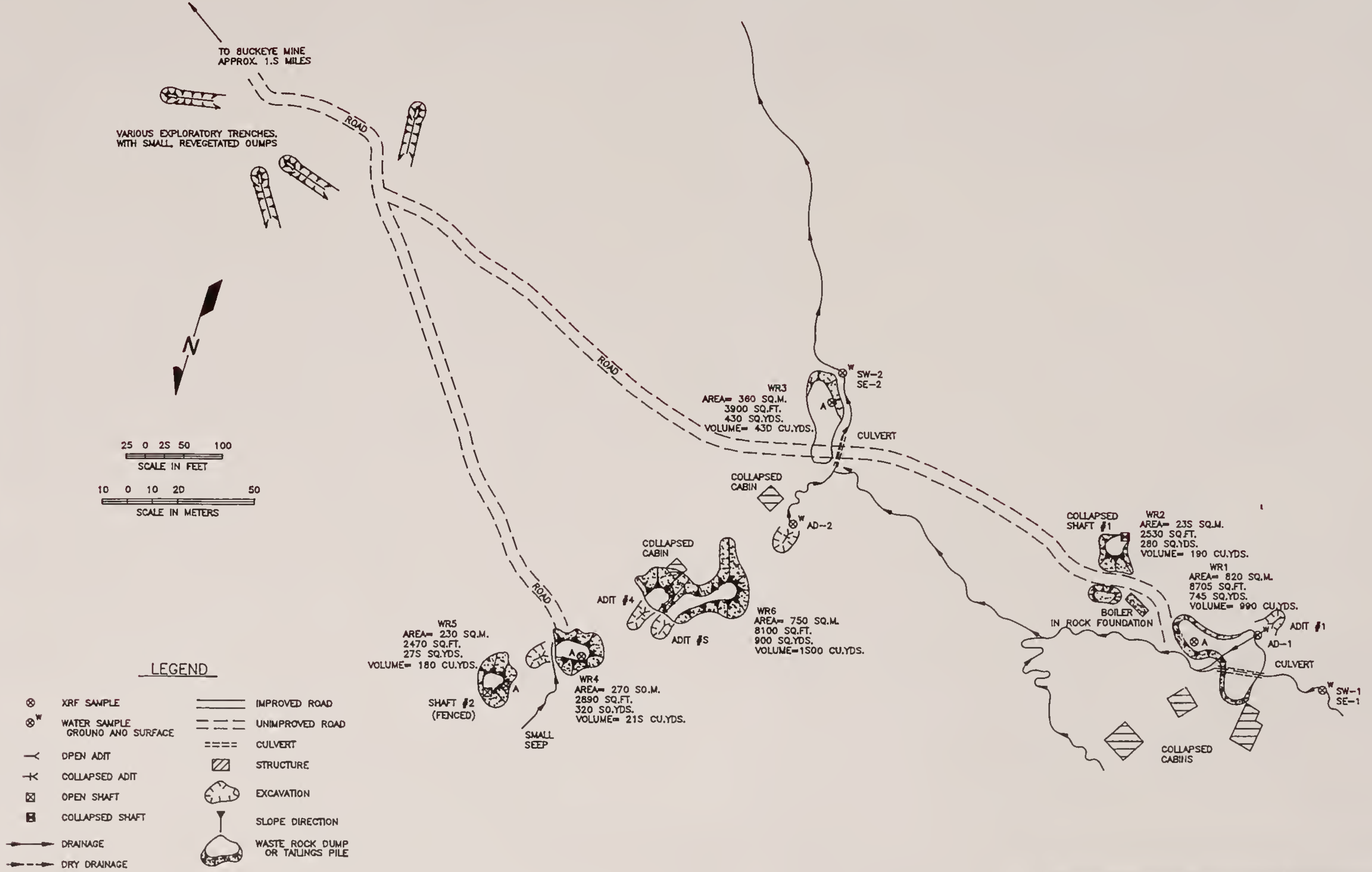
08/11/1994

Well No.	Location	Depth	Yield	Static Water Level
[illegible]:57350	08N 06W 25 CA	250.0	80.0	18.00
M:57349	08N 06W 25 CA	100.0	25.0	0.00
M:120003	08N 06W 25 CAC	210.0	15.0	11.00



PIONEER
TECHNICAL SERVICES, INC.

LADY LEITH, P.A. NO. 22-316
T07N, R05W, SECTION 06
SCALE: 1" = 1000'



PIONEER
TECHNICAL SERVICES, INC.

TITLE:
LADY LEITH (NE NW SEC. 6)
PA# 22-316

DRAWING NO.: PT340212 REV: -
DATE: 11/29/94 PLOT SCALE: 1 = 40

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. **Waste Characteristics** - *Use table on following page.*

Unique source identification: (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures/vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. **TAILINGS IMPOUNDMENTS** - *If tailings impoundments are also present, complete the following questions.*

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: Bisch, West

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1	WR	990	Uppermost dump below AD-1; toe of dump in tributary; orange/brown sand	None	3.9 (D)	0.05	22-316-WR-1	06/15/94 1230	T-Metals, ABA
WR-3	WR	430	Dump below AD-2; material has been pushed by dozer and some used for road (dump may be mixed with soil); gray sand/gravel	None	5.9 (D)	0.045	22-316-WR-3	06/15/94 1350	T-Metals, ABA
WR-4	WR	215	Dump associated with Adit #3; same material as WR-5	None	5.6 (D)	0.07			
WR-5	WR	180	Dump associated with Shaft #2; orange/brown sand/gravel	None	6.1 (D)	0.06			
WR-6	WR	1,500	Dump associated with Adit #4; orange/gray sand	None	4.7 (D)	0.05	22-316-WR-6	06/15/94 1415	T-Metals, ABA

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-316-WR-1 is grab of WR-1. 22-316-WR-3 is grab of WR-3. 22-316-WR-6 is composite of WR-4, -5, and -6. WR-2 was not sampled (very small and same material as WR-1). See Boulder Chief (22-132) for background soil sample.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes_X_, **No**___, **Number:**_2__ **Identification:**_AD-1 and AD-2_

Filled shafts: Yes___, **No**_X_, **Number:**____ **Identification:**____________

Seeps/Springs: Yes_X_, **No**___, **Number:**_2__ **Identification:**_Seeps were not sampled. One seep mixed with Adit #2 discharge after flowing 10' on the surface; one seep had very minor surface expression (30') above WR-4 with no measurable flow._

Groundwater wells within 4 miles?: Yes_X_, **No**___;
Number of well logs:_18___

Distance to nearest well used for drinking:
___**<1,000 ft;**___**1,000 ft to 0.5 miles;**_X_**>0.5 miles.**

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, **Probable**____, **Possible**_X__, **Unlikely**____.
Adit discharge water flowing through WR-1 likely seeps into the ground.

Approximate Depth to Groundwater:_X_**<25 ft;**___ **25 - 100 ft;**___ **>100 ft.**

Other observations/notes:_N/A_

GROUNDWATER INVENTORY FORM

SAMPLERS: Bisch, West

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
AD-1	AD	Uppermost adit with minor discharge; associated with WR-1	< 1 gpm (E)	3.6 (D)	374	415.9	7.8	0	N/A	22-316-AD-1	06/15/94 1200	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
AD-2	AD	Adit located above culvert; associated with WR-3	6 gpm (E)	6.82	223	101.2	7.9	42	N/A	22-316-AD-2	06/15/94 1308	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): Adit #1 discharge shows minor iron-staining in ponded area and some algae present. Adit #2 discharge shows significant iron-staining for approximately 35'.

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: **Yes** X, **No** ___, **Name(s):** Unnamed tributary to Basin Creek

Dry streambeds: **Yes** ___, **No** X, **Name(s):** ___

Other surface water: **Yes** X, **No** ___, **Name(s)/Description:** Two small seeps (not sampled)

Waste materials within any floodplain: **Yes** X, **No** ___ **Source ID(s):** WR-1 and WR-3

Approximate Flood frequency? X **1 yr,** ___ **10 yr,** ___ **100 yr**

Estimated seasonal flow of stream(s) (cfs/gpm)? 1 cfs
High Flow: 2.5 cfs, **Average Flow:** 0.5 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: **Yes** X, **No** ___,
Describe: Stream at toe of WR-1 and WR-3

Surface water use within 15 miles downstream? **(Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)**
Irrigation, possible agriculture, and wetlands.

Observed erosional/sedimentation/stream turbidity problems? Yes ___, **No** X. **Distance downstream (ft)? 0-500** ___; **500-1,000** ___; **>1,000** ___.
Describe/explain **(Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):** XRF results indicate arsenic is elevated in stream sediments 1,000 feet below the site.

SURFACE WATER INVENTORY FORM

SAMPLERS: Bisch, West

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	Upstream above site	7.99	87	7.6	15	20 gpm (E)	22-316-SW-1	06/15/94 1215	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-1	SE	Upstream above site	N/A	N/A	N/A	N/A	N/A	22-316-SE-1	06/15/94 1215	T-Metals
SW-2	SW	Downstream below culvert	7.8	NM	7.9	11	1 cfs (E)	22-316-SW-2	06/15/94 1322	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-2	SE	Downstream below culvert	N/A	N/A	N/A	N/A	N/A	22-316-SE-2	06/15/94 1322	T-Metals
SE-500	SE	500' downstream	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis
SE-1000	SE	1,000' downstream	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): Upstream sediment sample is very gravelly (no available fines).

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	*(SO_3)*
Presence of evaporative salt deposits?	*(ESD)*
Discolored or turbid seepage?	*(SPG)*
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	*(FEOX)*
Presence of burned or stressed vegetation?	*(VEG)*
pH $\leq$ 5.0	*(pH)*

General Potential for AMD Mitigation:

Area available for treatment (acres)? Very limited due to heavy timber and relatively steep terrain in all areas of the site.

Wetlands present: Yes___, No X, Describe:

Carbonate rocks/soils: Yes___, No X, Describe:

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 X; 10-30___; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments

Nearest residence:___<1,000 ft;___1,000 ft - 0.5 miles; X >0.5 miles.

For each source (table next page):

Available fine materials? *Surface area?*

Uncovered and unvegetated? *Wet or dry?*

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Bisch, West

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
WR-1	High SO3; pH	Moist from precip.; Partial	6,705	6,705	No	Low
WR-2	High SO3	Moist from precip.; Dry	2,530	2,280	No	Low
WR-3	Moderate SO3	Moist from precip.; Partial	3,900	1,950	No	Low
WR-4	Moderate SO3	Moist from precip.; Dry	2,890	2,890	No	Low
WR-5	Moderate SO3	Moist from precip.; Dry	2,470	2,470	No	Low
WR-6	High SO3; pH	Moist from precip.; Dry	8,100	8,100	No	Low
AD-1	Moderate filamentous algae; moderate FEOX; pH	N/A	N/A	N/A	N/A	N/A
AD-2	High FEOX	N/A	N/A	N/A	N/A	N/A

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes_____, No_X_
Describe:____

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments_None____

Evidence of recreational use on site: Yes_X_, No___, Describe:_All-Terrain Vehicle and motorcycle tracks at the site_______________

Accessibility (check each that apply):_X_Easily accessible - no fences, gates, or warning signs;___Moderately Accessible - barbed wire fences, road gated, or signs posted;___Difficult Access - chain-link fence, road gated and locked, site guarded (does not include locked or manned access points located more than 0.5 miles from the actual site).

Sensitive environments on-site or adjacent to site:
State or National Parks - Yes___, No_X_, Comment________________
Wilderness Area - Yes___, No_X_, Comment________________
T&E Species Habitat - Yes___, No_X_, Comment________________
Bat Habitat - Yes___, No_X_, Comment________________

Primary Drainage_X_; Secondary Drainage___; No Information___:
Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium___, Low_X_
Fisheries Habitat and Species Classification - _4_
Sport Fishery Classification - _4_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, No___, Number_1__, types and locations:___
Shaft #2; fenced with barbed wire.

Hazardous structures: Yes_X_, No___, Number_4__, types and locations:_
Collapsing cabins

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____, types and locations:________________________________

Unstable waste piles, impoundments, undercut banks: Yes_X_, No____, Number_3__, types and locations:_WR-4 is very steep; toes of WR-1 are in contact with the stream.

Fire and/or Explosion hazards: Yes___, No_X_, Explain:________________

Bibliography

MBMG, Abandoned-Inactive Mines Program, Deerlodge National Forest; Volume I, Open File Report No. 321, Prepared by John Metesh, Jeff Lonn, Ted Duaime, and Robert Wintergerst, April 1994.

MBMG, Mines and Mineral Deposits (Except Fuels), Jefferson County, Montana, Bulletin 16, Written by R.N. Roby, W.C. Ackerman, F.B. Fulkerson, and F.A. Crowley, June 1960.

MBMG, Sampling and Analysis Plan for the Lady Leith Mine, Jefferson County, Provided to Pioneer Technical Services, Inc., on March 18, 1994, by Ted Duaime, 1992.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for NE NW Section 6, Prepared by Northern Engineering and Testing, August 12, 1988.

USGS, Topographic Map, Three Brothers, Montana, 7 1/2 minute Quadrangle, 1985.

LABORATORY ANALYTICAL DATA

LADY LEITH
PA NO. 22-316

Lady Leith PA# 22-316
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BISCH
INVESTIGATION DATE: 06/15/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-316-SE1	0.6 U	41.4 JX	21.0	1.4 JX	4.8	7.1 J	15.3 J	11100 J	0.04 J	248 JX	3.3	77.1 JX	6.1 UJ	65.7	NR
22-316-SE2	0.6 U	211 JX	67.7	4.5 JX	15.4	8.9 J	31.7 J	21700 J	0.07 J	1190 JX	6.8	203 JX	6.6 UJ	357	NR
22-316-WR1	15.7	3080 JX	26.0	4.8 JX	10.7	5.3 J	58.7 J	35000 J	0.05 J	1360 JX	3.0	2730 JX	5.8 UJ	620	NR
22-316-WR3	3.6	79.2 JX	16.0	8.0 JX	10.9	4.4 J	67.5 J	30100 J	0.12 J	5820 JX	6.3	355 JX	4.8 UJ	981	NR
22-316-WR6	22.2	3740 JX	10.7	32.2 JX	12.7	1.7 J	246 J	40400 J	0.13 J	4720 JX	1.4 U	4950 JX	78.8 J	1100	NR
BACKGROUND	0.6 U	23.1	178	2.0 J	9.7	3.9	23.1	13600	0.04 J	1280	3.4	42.3	6.4 UJ	120	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-316-WR1	0.75	23.4	-3.18	-27	0.55	<0.01	0.20	0.00	-3.18
22-316-WR3	0.77	24.1	91.2	67.1	0.13	0.38	0.26	11.9	79.3
22-316-WR6	0.36	11.1	-1.85	-13.0	0.33	<0.01	0.03	0.00	-1.85

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-316-AD1	0.69 JX	15.9	5.1	10.6	21.7	4.7 U	16.4	1670	0.11	536	15.1	84.3	29.4 U	1180	55.5
22-316-AD2	0.12 UX	68.1	10.4	2.6 U	8.7 U	4.7 U	4.6 U	2430	0.11 U	1730	8.0 U	2.8	29.4 U	695	122
22-316-SW1	0.12 UX	3.4	2.8	2.6 U	8.7 U	4.7 U	4.6 U	35.0	0.11 U	4.4 U	8.0 U	1.1 U	29.4 U	13.5	16.9
22-316-SW2	0.12 UX	5.9	3.5	2.6 U	8.7 U	4.7 U	4.6 U	95.2	0.11 U	27.5	8.0 U	2.1	29.4 U	21.1	18.9

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-316-AD1	120	<5	81	<0.05	NR
22-316-AD2	131	<5	70	<0.05	NR
22-316-SW1	10	<5	<5	<0.05	NR
22-316-SW2	9.0	<5	5.0	<0.05	NR

LEGEND

SE1 - Upstream above site.
SE2 - Downstream below culvert.
WR1 - Grab sample of the WR1 subsample.
WR3 - Grab sample of the WR3 subsample.
WR6 - Composite of subsamples WR4, 5, and 6.
BACKGROUND - From the Boulder Chief Mine (22-132-SS1).

AD1 - Uppermost adit with minor discharge; associated with WR1.
AD2 - Adit located above culvert; associated with WR3.
SW1 - Same as sample 22-316-SE1.
SW2 - Same as sample 22-316-SE2.

XRF ANALYSIS RESULTS

LADY LEITH
PA NO. 22-316

Mine Name: Lady Leith PA# 22-316
XRF Field Analyses
Results in PPM

XRF SAMPLE I.D.	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Ni	Cu	Zn	As	Sr
22-316-SE1000		9900.15	7302.2	1424.01		4596.13	21016.1				522.453	183.386 *	302.906
22-316-SE500		8314.02	4564.77	918.79		3292.21	16929.1				443.317	156.638 *	244.562
22-316-WR1		27250.9	7765.64	2364.99		3942.74	55847.1				883.927	3493.38	109.861
22-316-WR3		17678.4	24687.9	1709.04		5276.48	28433.3				852.892	67.4595 *	
22-316-WR4	977.315 *	19057	3249.44	1145.98	339.537 *	5000.44	27032.9			163.182 *	808.055	1685.86	59.0954
22-316-WR5	3687.4	25957.6	2077.67	556.139 *		14265	60958.3	969.707 *	236.978 *	397.049 *	1337.12	4399.14	29.0118 *
22-316-WR6		26639.1	1803.57	982.403		3267.31	54144.2			223.674 *	762.318	5317.65	65.862
22-316-WR6-COMP		24581.3	2055.48	1186.87		9098.53	49291.1			232.863 *	1021.94	3499.13	41.4807 *

XRF SAMPLE I.D.	Zr	Hg	Mo	Pb	Rb	Cd	Sn	Sb	Ba	Ag	U	Th
22-316-SE1000	149.741			139.199	131.265				607.073			
22-316-SE500	86.5013			161.364	130.888				472.491			11.454 *
22-316-WR1	187.09		10.0785 *	2265.42	235.18				280.491			19.7993 *
22-316-WR3	124.233			157.292	170.901				221.68			16.6867 *
22-316-WR4	106.78	71.3761 *	19.1906 *	1778.3	147.041			163.322 *	168.541			59.5712 *
22-316-WR5	108.849	218.405 *	40.1568 *	4213.51	196.328			114.055 *				55.4711 *
22-316-WR6	168.876		19.6272 *	6093.84	227.794			481.898				31.6733 *
22-316-WR6-COMP	119.386		20.3081 *	3998.22	190.821			97.2577 *	82.0667 *			

* = Estimated Quantity

$ = Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

LADY LEITH
PA NO. 22-316

AIMSS SCORESHEET

SITE NAME: Lady Leith (NE NW S6)
PA NUMBER: 22-316

LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	10.968
6	GW - TARGETS	WELLS - 1 MI. x 2.5		7.5
7		WELLS - 1 TO 4 MI		15
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	22.5
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	98712
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		300
12		EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	700
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	11.658
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		1
18		WETLANDS		10
19		FISHERY		1
20		RECREATION		0
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	14
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	114248
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		5
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	25
27		LIKELIHOOD SCORE	LINES 25 + 26C	25
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.993
29	AIR - TARGETS	POPULATION - 4 MILES		1
30		NEAREST RESIDENCE		0
31		WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	1
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	25
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		50
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	150
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.934
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		0
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		5
43		TARGETS SCORE	SUM LINES 40 THRU 42	5
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	701
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE (LINES 10 + 24 + 35 + 44) / 100,000			2.14

SITE NAME: Lady Leith (NE NW S6)
PA NUMBER: 22-316

SITE SAFETY

LINE NO.				
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	100
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	160
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	260
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		5
12		TARGETS SCORE	SUM LINES 9 THRU 11	5
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	26.00

SUMMARY OF HISTORICAL ANALYTICAL DATA

FROM OTHER SOURCES

MDSL AMRB/PIONEER 5/16/94

Deerlodge National Forest
Basin Creek Drainage
Assay Results

Sample ID	Location	Description (Field Observation)	Au oz/ton	Ag oz/ton	Cu %	Pb %	Zn %
JJNA1	North Ada, Jefferson Co., Trench	Composite mixture of overburden and old mine dumps stirred together.	.008	.60	.230	.370	.070
JAJS1	North Ada, Jefferson Co., Dump	Vein material selected. Sulfide-rich (up to 40%) py-sph-gal-cor, qtz-sid	.076	8.58	.810	2.850	2.480
RJBU1	Bullion vein	Select	.268	15.80	.200	7.740	.900
RJBU2	Upper Bullion Mine, Jefferson Co., Tailings	Composite	.028	1.10	.023	.410	.037
RJBU3	Upper Bullion Mine, Jefferson Co., Tailings	Composite	.030	1.02	.035	.350	.029
RJBU4	Unknown Adit above upper Bullion Tailing	Composite of sulfide dump	.010	.08	.012	.047	.050
RJBD1	Un-Named adit main Bullion, NW Dump	Dump composite	.006	.24	.005	.006	.020
RJBD2	Un-Named adit main Bullion, SE Dump	Dump composite	.006	.02	.006	.007	.013
RJBD3	Un-Named adit main Bullion, SE Dump	Dump composite	.030	1.66	.190	.120	1.210
RJBC1	Bullion Creek Un-Named #1 Jefferson Co.	Composite of dump	.010	1.28	.066	1.080	.110
JJLB1	Lower Bullion Mill, Jefferson Co., Tailings	Composite of mostly unox tailings; qtz+ser? + unidentified dark minerals	.028	2.28	.021	.620	.047
JVJS1	Vindicator, Jefferson Co., Upper Trench	Comp. of "best" material from trench; alt Fe-stained wallrock&sparse chalcedony vein	.160	.26	.015	.048	.056
JVJS2	Vindicator, Jefferson Co., Caved Slope	Rep. thicks of, best part of zone, Chip channel, 3' of discontinuous vein(qtz-chal-py w/minor sph,gal,tet)&70	.048	7.80	.049	1.190	.500
JVJS3	Vindicator, Jefferson Co., North Dump	Dump composite, mainly Fe-stained wallrock w/some qtz-py(50%) vein	.060	.72	.022	.220	.070
JVJS4	Vindicator, Jefferson Co., Main Cut	Chip channel,5', several .5-1" channel vein w72' silicified zone & kaol, wallrock	.014	.02	.008	.011	.022
JVJS5	Vindicator, Jefferson Co., Main Cut	Chip channel, 5', 18" vein & wallrock w/ser-qtz-dissem py in shear zone	.016	.48	.036	.350	.410
JVJS6	Vindicator, Jefferson Co., Main Dump	Composite of entire 'disturbed' dump	.012	.18	.026	.072	.084
JMJS1	Morning, Jefferson Co., Main Dump	Vein material; qtz-py (up to 50%) with some sph & gal	.120	19.10	.590	5.720	2.190
JMJS2	Morning, Jefferson Co., Main Dump	Composite of entire dump; Fe-stained ox wallrock & clays	.034	1.98	.075	.780	.068
JHJS1	Hawkeye, Jefferson Co., Upper Dump	Partly ox bk py-chal w/bk sooty sph(?). Select from dump	.032	1.76	.240	.140	.055
JHJS2	Hawkeye, Jefferson Co., Lower Dump	Select of vein from ore bin area. Qtz, chal, py, gal, sph, Fe-carb	.030	7.64	.570	1.330	.180
JJAE1	Adelaide, Jefferson Co., Main Dump	Composite of ox Fe-stained alt (kaol+ser-qtz) wallrock	.006	.02	.018	.320	.180
JJHE1	Hector, Jefferson Co., Main Vein	25' CC across vein area & altered wallrock	.008	.40	.025	.100	.180
JJHC1	Hector Mine, Jefferson Co., Dump	Composite of mineralized portions of dump. Kgm alt to kaol-py tr qtz-pyun	.006	.48	.170	.420	.550
JJBU1	Buckeye, Jefferson Co., Main Dump	Composite of main dump, kgm alt to ser-qtz-ab py	.090	3.02	.013	1.910	.110
JJBU2	Buckeye, Jefferson Co., Lower Tailings	Composite of ox & unox, stained tailings; mostly qtz	.098	1.12	.025	.390	.062
JJBU3	Buckeye, Jefferson Co., Upper Dump	Composite; mostly unox ser-qtz-py wallrock (kgm)	.036	.94	.024	.580	.078
JJLL1	Lady Leith, Jefferson Co., Main Dumps	Select of vein; Li-sulfide (py, ab gal)	.182	11.40	.420	3.100	.200
JJLL2	Double Shaft, Jefferson Co., Trenches	Samples oxidized Fe-stained siliceous breccia from 2 trenches	.006	.38	.000	.000	.000
JJGG1	Golden Glow, Jefferson Co., Dump	Select of vein from upper dump. Qtz, bk chal, tour, py, gal, aspy(?), tmph.	.184	.28	.077	3.670	2.280
JJMS1	Morning Star, Jefferson Co., Dump	Select of silicified qtz-py breccia	.048	2.14	.021	.200	.034
JJSO1	Solar, Jefferson Co., Dump	Select sample of vein; hi sulfide (50%) w/ab py & 10% fct, ab tour, qtz	.058	3.32	.035	.510	.068
JJJE1	Jessie Mine, Jefferson Co., Dump	Select of vein material on dump	.040	2.30	.048	.270	.680
JJBB3	Basin Bell, Jefferson Co., Dump	Composite of main dump - some vein (qtz-50% py-sph), mostly kgm alt to kaol	.016	1.02	.320	.590	.120
JJAU1	Aurora Mine, Jefferson Co., Dump	Select of vein from dump. Hi sulfide - 50% py, 10% gal, am sph	.274	5.06	.350	6.800	6.670
JJDW1	Daily West, Jefferson Co., Dump	Comp. of main sect. of dump-ox+unox vein(qtz-py)+kgm alt to qtz-ser-py+kaol-py	.014	.62	.072	1.760	.660

US FOREST SERVICE - DEERLODGE NATIONAL FOREST
BASIN CREEK DRAINAGE

Water Quality Results - Dissolved Concentrations

BULLION MINE

Mine/ Sample ID	Lab ID	Sample Site Location	pH (field)	Fe (mg/l)	Mn (mg/l)	Cl (mg/l)	SO4 (mg/l)	NO3 (mg/l)	F (mg/l)	Al (ug/l)	Ag* (ug/l)	As* (ug/l)	Ba* (ug/l)	Cd* (ug/l)	Cr* (ug/l)	Cu* (ug/l)	Hg* (ug/l)	Ni* (ug/l)	Pb* (ug/l)	Zn* (ug/l)
BBUS10M	92Q339	Unnamed #1, abv. conf. w/Jack Cr.	6.96	.046	.800	.2	45.8	-.10	.15	39.0	-.60	1.44	18.64	22.71	-.90	44.8	.07	5.43	.50	1968.0
BBUS20L	92Q338	Jack Cr. abv. conf. w/Unnamed #1	8.04	.033	-.002	.2	8.4	-.10	.13	27.0	-.60	4.83	10.10	-.60	-.90	3.6	.05	-2.40	.94	12.3
BBUS30M	92Q337	Jack Cr. downstream conf. w/ unnamed #1	7.47	.059	.182	.2	16.9	-.10	.17	49.0	-.60	2.56	15.64	3.98	-.90	21.7	.10	-2.40	-.40	373.3
BBUS40L	92Q309		7.09	.060	.002	.2	6.3	-.10	.11	62.6	-.60	2.22	19.87	-.60	-.90	4.9	.14	-2.40	1.21	31.7
BBUS50H	92Q308	Drainage from adit	2.58	129.0	23.2	-10.0	934.0	-.25	.64	17720.0	-.60	166.22	20.27	397.32	2.45	4698.0	.14	41.49	167.58	28230.0
BBUS60M	92Q316	Unnamed Cr. immed. below site	6.56	.231	1.0	.2	49.0	-.10	.12	86.0	-.60	1.30	14.05	20.55	-.90	71.9	.12	4.99	.53	2216.0
BBUS70M	92Q317	Mill site, downstream of caved adit	6.93	2.5	.533	.2	14.4	-.10	.39	59.0	-.60	2.34	41.37	-.60	-.90	-1.4	.12	-2.40	-.40	13.0
BBUS80L	92Q315	2nd Unnamed Cr., abv. site	6.87	.033	.004	.2	7.8	-.10	.10	83.0	-.60	1.23	34.95	-.60	-.90	2.5	.19	-2.40	-.40	17.0
BBUS90M	92Q318	Below caved adit, above mill site	7.36	.038	-.002	.2	7.8	-.10	.21	41.0	-.60	.92	31.24	-.60	-.90	-1.4	.15	-2.40	-.44	6.7
BBUSA0M	92Q340	Unnamed #2, downstream of smelter site	9.04	.031	.004	-.2	7.5	-.10	.20	31.0	-.60	1.35	37.49	-.60	-.90	-1.4	.15	-2.40	-.40	5.5
BBUSB0L	92Q341	Duplicate of Jack Cr. downstream(BBUS30M)	7.47	.054	.180	.2	17.1	-.10	.14	58.0	-.60	3.11	18.75	4.64	-.90	27.4	.07	1.42	-.40	442.8
BBUS10M-A	92Q421	Unnamed #1, abv. conf. w/Jack Cr.	6.96	.020	.860	-1.0	47.0	-.10	.07	28.0	-.60	.93	14.80	20.25	-.90	39.2	.05	5.20	-.40	1892.3
BBUS20L-A	92Q418	Jack Cr. abv. conf. w/Unnamed #1	7.63	.024	.002	-1.0	8.8	-.10	.06	45.0	.64	6.61	14.57	-.60	1.18	4.4	-.05	-2.40	.82	23.6
BBUS30M-A	92Q419	Jack Cr. downstream conf. w/ unnamed #1	7.48	.042	.168	-1.0	16.2	-.10	.06	34.0	-.60	2.83	18.74	3.83	-.90	22.8	-.05	-2.40	-.40	365.0
BBUS40L-A	92Q414	Above adit discharge	7.37	.022	.002	-1.0	6.5	-.10	.07	78.0	-.60	2.89	23.19	-.60	1.54	4.3	-.05	-2.40	1.40	28.3
BBUS60M-A	92Q413	Unnamed Cr. immed. below site	6.27	.751	1.1	-1.0	55.6	-.10	.12	38.0	-.60	1.72	25.57	74.49	-.90	141.2	-.05	7.64	1.05	2685.0
BBUS80L-A	92Q415	2nd Unnamed Cr. abv. site	7.58	.009	-.002	-1.0	7.8	-.10	.08	36.0	-.60	1.35	44.64	-.60	-.90	-1.4	-.05	-2.40	.72	6.0
BBUS90M-A	92Q420	Below caved adit, above mill site	7.60	.025	.002	-1.0	7.9	-.10	.06	19.0	-.60	1.11	35.92	-.60	-.90	-1.4	-.05	-2.40	-.40	11.5
BBUSA0M-A	92Q416	Unnamed #2, downstream of smelter site	7.58	.016	.002	-1.0	8.1	-.10	.06	39.7	-.60	1.58	42.33	-.60	-.90	-1.4	-.05	-2.40	-.40	8.7
BBUSB0L-A	92Q417	Duplicate of Jack Cr. downstream(BBUS30M-A)	7.48	.025	.173	-1.0	16.1	-.10	.08	50.0	-.60	3.18	22.14	4.45	-.90	24.9	-.05	-2.40	-.40	413.6
NO. EXCEEDED CWA-PRIMARY			-	-	-	-	-	0	0	-	-	1	0	5	0	-	0	0	1	-
NO. EXCEEDED CWA-SECONDARY			3	3	10	0	1	-	0	8	0	-	-	-	-	1	-	-	-	1
NO. EXCEEDED AQLC-ACUTE (1)			-	2	-	-	-	-	-	1	0	0	-	8/5	0	9/5	0	0	1/0	9/9
NO. EXCEEDED AQLC-CHRONIC (1)			-	-	-	-	-	-	-	1	0	0	-	9/9	0	9/9	13	0	1/1	9/9

NORTH ADA-PIERMONT

Mine/ Sample ID	Lab ID	Sample Site Location	pH (field)	Fe (mg/l)	Mn (mg/l)	Cl (mg/l)	SO4 (mg/l)	NO3 (mg/l)	F (mg/l)	Al (ug/l)	Ag* (ug/l)	As* (ug/l)	Ba* (ug/l)	Cd* (ug/l)	Cr* (ug/l)	Cu* (ug/l)	Hg* (ug/l)	Ni* (ug/l)	Pb* (ug/l)	Zn* (ug/l)
BNAS10H	92Q271	Downstream of shaft	3.14	15.5	3.1	-.1	164.0	-.05	.11	1880.0	.94	59.05	31.63	68.41	1.59	463.4	-.10	12.09	101.42	7596.0
BNAS20H	92Q276	Upstream of main dist. area (background)	6.56	.028	-.002	.2	3.2	-.05	.06	-50.0	-.60	1.43	8.25	-.60	-.90	-1.4	-.10	-2.40	.44	5.6
BNAS30H	92Q277	Below dump on Basin Creek side	3.70	4.2	.218	.2	43.2	-.05	.07	1130.0	-.60	15.40	8.41	6.08	1.00	93.7	-.10	2.71	4.32	700.5
BNAS40H	92Q278	Shaft, 10 ft. below water surface	3.92	1.300	.079	.2	25.8	-.05	.04	154.0	-.60	27.38	13.58	4.14	-.90	40.5	-.10	4.85	75.04	495.7
NO. EXCEEDED CWA-PRIMARY			-	-	-	-	-	0	0	-	-	1	0	2	0	-	0	0	2	-
NO. EXCEEDED CWA-SECONDARY			3	3	3	0	0	-	0	3	0	-	-	-	-	0	-	-	-	1
NO. EXCEEDED AQLC-ACUTE (1)			-	3	-	-	-	-	-	2	0	0	-	3/1	0	3/3	0	0	1/0	3/3
NO. EXCEEDED AQLC-CHRONIC (1)			-	-	-	-	-	-	-	3	1	0	-	3/3	0	3/3	+	0	3/2	3/3

MORNING MINE

Mine/ Sample ID	Lab ID	Sample Site Location	pH (field)	Fe (mg/l)	Mn (mg/l)	Cl (mg/l)	SO4 (mg/l)	NO3 (mg/l)	F (mg/l)	Al (ug/l)	Ag* (ug/l)	As* (ug/l)	Ba* (ug/l)	Cd* (ug/l)	Cr* (ug/l)	Cu* (ug/l)	Hg* (ug/l)	Ni* (ug/l)	Pb* (ug/l)	Zn* (ug/l)
BMOS10M	92Q275	Upper adit	6.31	.030	.008	.2	10.7	-.05	.05	-50.0	-.60	10.28	6.33	4.20	-.90	77.6	-.10	-2.40	-.40	384.9
BMOS20M	92Q274	Lower adit	6.31	.480	.480	.1	27.7	-.05	.05	-50.0	-.60	9.69	16.02	8.86	-.90	253.9	-.10	2.40	-.40	1277.0
NO. EXCEEDED CWA-PRIMARY			-	-	-	-	-	0	0	-	-	0	0	1	0	-	0	0	0	-
NO. EXCEEDED CWA-SECONDARY			2	1	1	0	0	-	0	0	0	-	-	-	-	0	-	-	-	0
NO. EXCEEDED AQLC-ACUTE (1)			-	0	-	-	-	-	-	0	0	0	-	2/1	0	2/2	0	0	0	2/2
NO. EXCEEDED AQLC-CHRONIC (1)			-	-	-	-	-	-	-	0	+	0	-	2/2	0	2/2	+	0	0	2/2

US FO[illegible]T SERVICE - DEERLODGE NATIONAL FOREST
BASIN CREEK DRAINAGE

Water Quality Results - Dissolved Concentrations

Mine/ Sample ID	Lab ID	Sample Site Location	pH (field)	Fe (mg/l)	Mn (mg/l)	Cl (mg/l)	SO4 (mg/l)	NO3 (mg/l)	F (mg/l)	Al (ug/l)	Ag* (ug/l)	As* (ug/l)	Ba* (ug/l)	Cd* (ug/l)	Cr* (ug/l)	Cu* (ug/l)	Hg* (ug/l)	Ni* (ug/l)	Pb* (ug/l)	Zn* (ug/l)
VINDICATOR MINE																				
BVIS10M	92Q264	Adit discharge, sidehill	7.37	.072	.052	.2	13.9	.06	.14	61.5	-.60	1.88	2.81	4.69	-.90	44.3	-.10	-2.40	5.57	293.0
BVIS40M	92Q265	Flow from upper mine area to lower area	7.28	.019	-.002	.2	30.7	.06	.11	23.5	-.60	4.98	4.59	1.14	-.90	2.5	-.10	-2.40	-.40	162.3
BVIS50M	92Q266	Below falls, disch. below main workings	7.90	.384	.144	.2	20.9	-.05	.12	47.1	-.60	29.29	15.10	-.60	1.11	1.7	-.10	-1.31	1.45	23.8
BVIS60M	92Q267	Duplicate of BVIS50M	7.90	.344	.141	.2	21.1	-.05	.15	35.0	-.60	26.71	15.42	-.60	-.90	2.1	-.10	2.67	1.46	22.2
NO. EXCEEDED CWA-PRIMARY			-	-	-	-	-	0	0	-	-	0	0	0	0	-	0	0	0	-
NO. EXCEEDED CWA-SECONDARY			0	2	3	0	0	-	0	1	0	-	-	-	-	0	-	-	-	0
NO. EXCEEDED AQLC-ACUTE (1)			-	0	-	-	-	-	-	0	0	0	-	1/0	0	1/1	0	0	0	2/1
NO. EXCEEDED AQLC-CHRONIC (1)			-	-	-	-	-	-	-	0	+	0	-	2/1	0	1/1	+	0	1/0	2/1
HAWKEYE MINE																				
BHES10L	92Q307	Seepage above mine workings	6.87	.063	.012	.2	17.0	.46	.14	33.3	-.60	2.78	8.18	.78	-.90	-1.4	.10	-2.40	1.59	58.2
BHES20L	92Q299	Jack Cr. abv. mine site	7.80	.028	.004	.2	7.0	-.05	.05	36.8	-.60	2.73	8.40	.60	-.90	5.5	.14	-2.40	-.40	31.1
BHES30M	92Q298	Seepage at base of main dump	6.99	.247	3.7	5.0	21.9	.47	.09	34.0	-.60	11.09	36.92	-.60	3.53	-1.4	.12	6.43	.49	152.0
BHES40L	92Q300	Jack Cr. below site	7.85	.025	.007	.2	9.1	-.05	.05	-50.0	-.60	3.56	8.49	-.60	-.90	4.1	-.05	-2.40	.42	11.6
NO. EXCEEDED CWA-PRIMARY			-	-	-	-	-	0	0	-	-	0	0	0	0	-	0	0	0	-
NO. EXCEEDED CWA-SECONDARY			0	0	1	0	0	-	0	0	0	-	-	-	-	0	-	-	-	0
NO. EXCEEDED AQLC-ACUTE (1)			-	0	-	-	-	-	-	0	-	0	-	0	0	0	0	0	0	1/0
NO. EXCEEDED AQLC-CHRONIC (1)			-	-	-	-	-	-	-	0	+	0	-	0	0	0	3	0	0	1/0
BUCKEYE-ENTERPRISE																				
BBAS10H	92Q346	Adit discharge, eastern part of site	3.18	137.0	28.1	5.4	678.0	-.10	.46	12270.0	-.60	3438.05	22.24	119.50	2.79	609.0	-.05	19.40	1173.66	15020.0
BBAS20L	92Q345	Basin Cr. upstream of mine site	6.71	.071	.005	.2	1.5	-.10	.08	158.0	-.60	2.36	12.62	-.60	-.90	3.7	.18	-2.40	-.40	10.7
BBAS30H	92Q344	Conf sml seepe-base of main wste rock dump	2.77	48.9	36.6	4.2	645.0	-.10	.49	40000.0	.72	235.31	10.31	156.82	2.36	1879.0	.18	15.41	128.37	15730.0
BBAS40L	92Q355	Basin Cr. @bridge bel. lrg.tailings wash	7.87	.164	.165	.4	8.1	.05	.08	183.0	-.60	20.16	12.59	1.54	-.90	12.9	.11	2.37	11.20	152.5
NO. EXCEEDED CWA-PRIMARY			-	-	-	-	-	0	0	-	-	2	0	2	0	-	0	0	2	-
NO. EXCEEDED CWA-SECONDARY			2	2	3	0	2	-	0	4	0	-	-	-	-	1	-	-	-	2
NO. EXCEEDED AQLC-ACUTE (1)			-	2	-	-	-	-	-	2	0	1	-	2/2	0	2/2	0	0	2/1	3/2
NO. EXCEEDED AQLC-CHRONIC (1)			-	-	-	-	-	-	-	4	0	2	-	3/2	0	3/3	3	0	3/3	3/2
LADY LEITH MINE																				
BLLS10L	92Q358	Unnamed Cr upstrm eastern portion site	6.82	.011	-.002	.3	4.9	.03	.06	-20.0	-.60	3.81	6.66	-.60	-.90	-1.4	-.05	-2.40	.54	5.7
BLLS20H	92Q362	Adit seepage, eastern portion site	3.35	2.0	1.3	-1.0	101.5	-.10	.14	2170.0	-.60	2.08	16.13	14.42	-.90	37.1	-.05	8.82	218.24	1282.0
BLLS30L	92Q359	Unnamed Cr dwnstrm E part & up W part	7.94	.013	.007	.4	6.2	.05	.04	38.2	-.60	5.10	9.65	-.60	-.90	-1.4	.06	-2.40	1.08	37.2
BLLS40H	92Q360	Adit seepage, W part of mine site	3.34	.122	.813	.2	41.5	-.05	.07	-20.0	-.60	10.80	8.35	-.60	-.90	-1.4	-.05	1.43	-.40	312.6
BLLS50L	92Q361	Unnamed Cr dwnstrm of mine site	7.69	.029	.021	-.5	6.9	-.05	.04	41.5	-.60	4.60	8.01	-.60	-.90	-1.4	-.05	-2.40	3.19	33.0
NO. EXCEEDED CWA-PRIMARY			-	-	-	-	0	0	0	1	0	0	0	1	0	-	0	0	1	-
NO. EXCEEDED CWA-SECONDARY			2	1	2	0	-	-	0	-	-	-	-	-	-	0	-	-	-	0
NO. EXCEEDED AQLC-ACUTE (1)			-	1	-	-	-	-	-	1	0	0	-	1/1	0	1/1	0	0	1/1	2/2
NO. EXCEEDED AQLC-CHRONIC (1)			-	0	-	-	-	-	-	1	0	0	-	1/1	0	1/1	+	0	1/1	2/2

US FOREST SERVICE - DEERLODGE NATIONAL FOREST
BASIN CREEK DRAINAGE

Water Quality Results - Dissolved Concentrations

Mine/ Sample ID	Lab ID	Sample Site Location	pH (field)	Fe (mg/l)	Mn (mg/l)	Cl (mg/l)	SO4 (mg/l)	NO3 (mg/l)	F (mg/l)	Al (ug/l)	Ag* (ug/l)	As* (ug/l)	Ba* (ug/l)	Cd* (ug/l)	Cr* (ug/l)	Cu* (ug/l)	Hg* (ug/l)	Ni* (ug/l)	Pb* (ug/l)	Zn* (ug/l)
WINTER CAMP																				
BWCS10L	92Q431	Joe Bowers Creek below adit discharge	7.34	.016	.003	-.1	9.7	-.10	.04	30.0	-.60	.97	16.19	-.60	-.90	2.1	-.05	-2.40	1.23	14.1
NO. EXCEEDED CWA-PRIMARY			-	-	-	-	-	0	0	-	-	0	0	0	0	-	0	0	0	-
NO. EXCEEDED CWA-SECONDARY			0	0	0	0	0	-	0	0	0	-	-	-	-	0	-	-	-	0
NO. EXCEEDED AQLC-ACUTE (1)			-	0	-	-	-	-	-	0	0	0	-	0	0	0	0	0	0	0
NO. EXCEEDED AQLC-CHRONIC (1)			-	-	-	-	-	-	-	0	0	0	-	0	0	0	+	0	0	0
HECTOR MINE																				
BHFS10L	92Q432	Unnamed Cr upstrm of mine site	8.43	.004	-.002	1.0	46.1	-.10	.17	-20.0	-.60	1.04	17.95	.61	-.90	-1.4	.09	-2.40	-.40	103.5
BHFS20L	92Q433	Unnamed Cr dwnstrm of two upstream adits	8.41	.009	.003	1.1	46.1	-.10	-.10	-20.0	-.60	1.11	23.18	.77	-.90	1.8	-.05	-2.40	.66	87.1
BHFS30L	92Q434	Unnamed Cr flow over waste rock dump	8.50	.009	.004	1.1	26.5	-.10	-.10	-20.0	-.60	.91	43.48	-.60	-.90	1.1	-.05	-2.40	-.40	8.1
BHFS40L	92Q435	Unnamed Cr dwnstrm where Cr branches join	7.81	.008	.028	1.1	44.8	-.10	-.10	-20.0	-.60	-.70	24.93	.94	-.90	1.9	-.05	-2.40	-.40	168.7
BHFS50L	92Q436	Southern end site, upstrm wste dump & adit	8.15	.006	.002	1.0	25.3	-.10	.24	21.0	-.60	1.18	59.90	-.60	-.90	.7	-.05	-2.40	-.40	8.1
BHFS60L	92Q437	Unnamed Cr ddwnstrm of wste dump & adit	8.21	.007	.002	1.1	26.2	-.10	.22	24.0	-.60	.80	53.23	-.60	-.90	.7	-.05	-2.40	-.40	29.2
BHFS70L	92Q438	Duplicate of BHFS60L	8.21	.004	-.002	1.1	26.1	-.10	.22	-20.0	-.60	.63	54.82	-.60	-.90	-1.4	-.05	-2.40	-.40	6.1
NO. EXCEEDED CWA-PRIMARY			-	-	-	-	-	0	0	-	-	0	0	0	0	-	0	0	0	-
NO. EXCEEDED CWA-SECONDARY			0	0	0	0	0	-	0	0	0	-	-	-	-	0	-	-	-	0
NO. EXCEEDED AQLC-ACUTE (1)			-	0	-	-	-	-	-	0	0	0	-	0	0	0	0	0	0	1/0
NO. EXCEEDED AQLC-CHRONIC (1)			-	-	-	-	-	-	-	0	0	0	-	0	0	0	1	0	0	1/0
BASIN CREEK																				
BBCS10L	92Q463	Jack Cr upstrm conf with Basin Cr	7.79	.067	.094	-1.0	17.0	-.10	.16	48.0	-.60	4.95	25.86	3.72	-.90	16.4	.07	-2.40	-.40	205.6
BBCS20L	92Q461	Basin Cr upstrm of conf with Jack Cr	7.81	.076	.004	3.5	6.2	-.10	.14	65.0	-.60	8.43	20.41	-.60	-.90	2.9	-.05	-2.40	1.00	17.1
BBCS30L	92Q462	Basin Cr below conf with Jack Cr	7.38	.073	.035	2.1	10.2	-.10	.12	55.0	-.60	6.58	22.58	1.33	-.90	8.9	.12	-2.40	.64	98.4
BBCS40L	92Q464	Basin Cr abv conf Spring Cr,abv Basin	7.82	.222	.021	1.2	8.9	-.10	.14	44.0	-.60	14.51	21.88	.84	-.90	7.8	-.05	-2.40	.92	54.7
NO. EXCEEDED CWA-PRIMARY			-	-	-	-	-	0	0	-	-	0	0	0	0	-	0	0	0	-
NO. EXCEEDED CWA-SECONDARY			0	0	0	0	0	-	0	2	0	-	-	-	-	0	-	-	-	0
NO. EXCEEDED AQLC-ACUTE (1)			-	0	-	-	-	-	-	0	0	0	-	0	0	0	0	0	0	1/0
NO. EXCEEDED AQLC-CHRONIC (1)			-	-	-	-	-	-	-	0	0	0	-	2/1	0	1/1	2	0	0	1/1

A minus (-) sign before a number means the concentration is less than the Method Detection Limit (MDL), for that analyte.
Value shown is the MDL, per SOW 200.8.

* Critical elements, lab data has been qualified according to QAPP.

(1) Where two values are listed, criteria is hardness dependent.
Values are calculated on hardness of 100 and 200 mg/l, respectively.

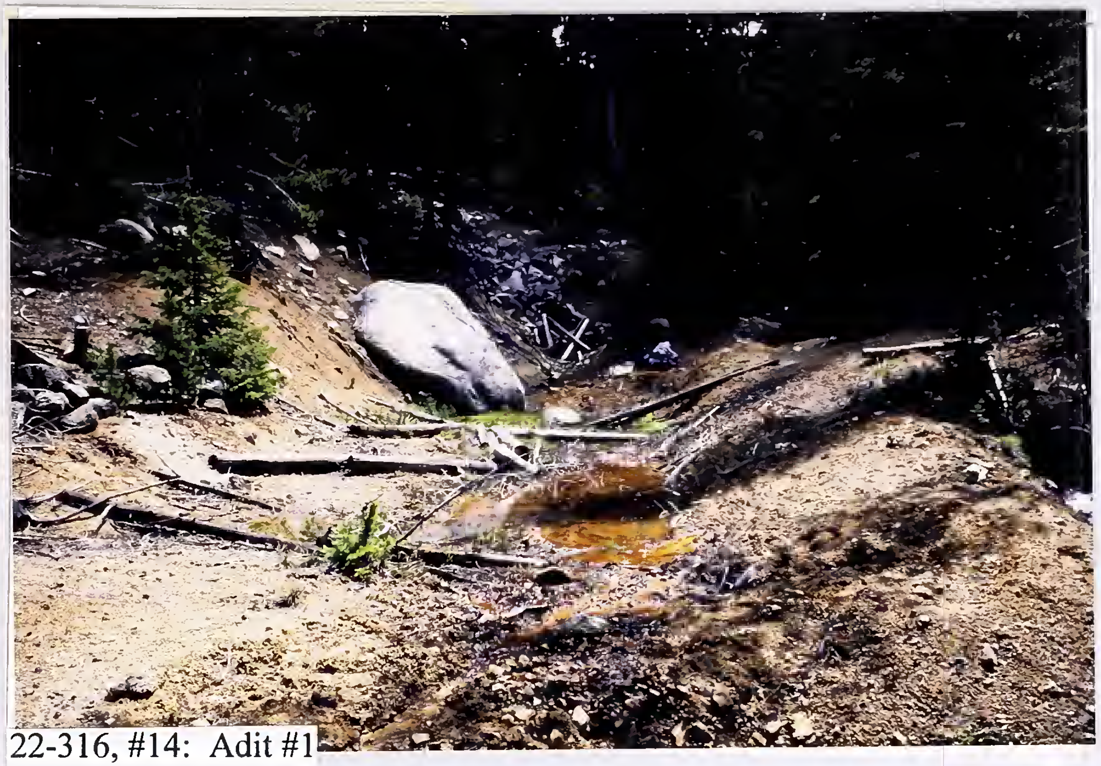
+ MDL is above Chronic Aquatic Life Criteria.

US FOREST SERVICE - DERRLODGE NATIONAL FOREST
BASIN CREEK DRAINAGE

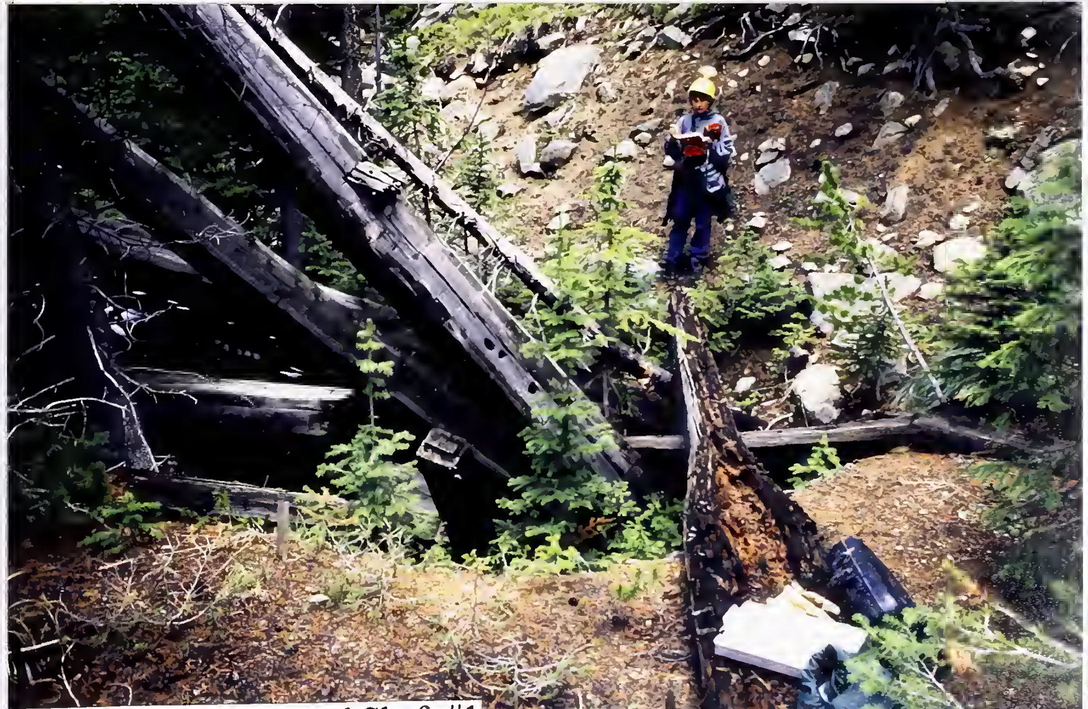
Soil Analyses - Lab Qualified
(Concentrations mg/kg)

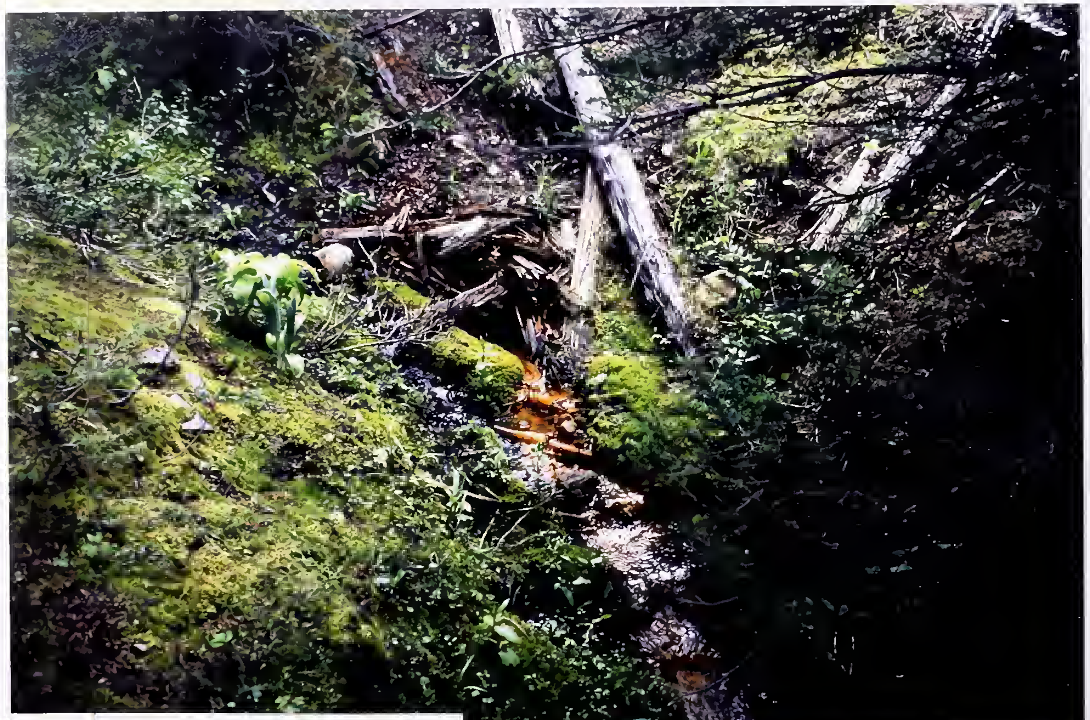
Mine/ Sample ID	Lab ID	Ag	C	Q	As	C	Q	Ba	C	Q	Cd	C	Q	Cr	C	Q	Cu	C	Q	Hg	C	Q	Ni	C	Q	Pb	C	Q	Zn	C	Q
VINDICATOR MINE																															
BVID10M	92S268	.89	B		25.87			24.76	B		1.47	B		4.04	B		38.00	B		.45			3.86	B		97.27			151.04		
BVID20M	92S269	.84	B		175.71			7.42	B		1.41	B		.00	U		26.71	B		.45			2.97	B		107.83			94.28		
NORTH ADA-PIERMONT																															
BNAD10H	92S280	3.40	B		1780.00			27.11	B		.31	B		2.78	B		56.59			.45			.00	U		1673.00			154.50		
BNAD10H	92S281	.00	U		.00	U		.00	U		.56	B		.00	U		.00	U		.19	B		.00	U		.00	U		14.94	B	
HAWKEYE MINE																															
BHED10M	92S304	.43	B		36.21			40.60	B		1.40	B		4.73	B		29.57	B		.26	B		7.87	B		42.08			134.53		
BHED20M	92S303	1.61	B		97.62			22.82	B		3.21	B		3.55	B		61.84			.50			6.07	B		123.22			309.57		
BULLION MINE																															
BBUD10H	92S311	30.92			7835.00			53.66	B		8.90	B		2.70	B		309.47			2.37			2.01	B		5356.00			1937.00		
BBUD20H	92S312	5.14	B		794.20			40.94	B		1.30	B		.00	U		49.19	B		.70			1.37	B		504.37			86.56		
BBUD30L	92S320	33.56		N	10979.29			85.00	B	N	8.13	B	N	4.07	B	N	398.73		N	1.71			1.23	B	N	2445.77			1055.62		
BBUD40L	92S321	.00	U	N	5.82	B		.00	U	N	.51	B	N	.00	U	N	.00	U	N	.21	B		.94	B	N	3.27	B		.00	U	
BBUD50L	92S322	.00	U	N	.00	U		.00	U	N	.58	B	N	.00	U	N	.00	U	N	.25	B		.00	U	N	.00	U		6.92	B	
BUCKEYE-ENTERPRISE																															
BBAD10H	92S347	58.66		N	4568.00			140.98	B	N	5.43	B	N	2.40	B	N	238.40		N	.68			.00	U	N	4029.00			117.00		
BBAD20H	92S356	28.17		N	7698.00			59.93	B	N	3.42	B	N	5.95	B	N	149.43		N	1.10			3.86	B	N	5841.00			259.75		
BBAD30H	92S357	22.22		N	9173.00			63.20	B	N	1.99	B	N	4.02	B	N	95.56		N	.83			2.82	B	N	3946.00			137.51		
LADY LEITH MINE																															
BLLD10H	92S364	3.02	B	N	264.71			47.78	B	N	1.49	B	N	4.42	B	N	20.78	B	N	.54			4.30	B	N	315.73			190.09		
BLLD20H	92S363	16.14	B	N	3146.00			29.73	B	N	4.27	B	N	1.33	B	N	76.68		N	.63			5.16	B	N	2404.00			729.80		
BLLD30H	92S365	.00	U	N	356.01			77.84	B	N	9.91	B	N	8.91	B	N	294.94		N	.65			4.01	B	N	166.31			628.49		
BASIN BELLE MINE																															
BBB10H	92S428	12.22	B	N	33.31			72.06	B	N	6.43	B	N	4.18	B	N	1429.32		N	.96	B		3.15	B	N	1825.01			1312.84		
HECTOR MINE																															
BHFW10H	92S429	.00	U	N	59.21			24.41	B	N	3.94	B	N	2.82	B	N	89.74		N	1.59			2.30	B	N	831.79			880.63		
BHFW20H	92S467	9.99	B	N	61.93			27.34	B	N	6.39	B	N	2.58	B	N	345.38		N	1.49			.52	U	N	483.98			1374.15		
BHFW30L	92S430	.00	U	N	.00	U		.00	U	N	.00	U	N	.48	U	N	.00	U	N	.40			.00	U	N	.00	U		1.59	U	
DAILY WEST MINE																															
BDWD10H	92S468	.00	U	N	44.13			47.70	B	N	1.08	B	N	2.74	B	N	89.83		N	1.02			.00	U	N	2325.81			251.17		
BDWW20H	92S469	4.11	B		65.52			28.00	B		.79	B		1.12	U	N	132.50		N	1.21			.00	U	N	2930.41			366.04		
BDWD20H	92S470	5.44	B		111.68			73.79	B		.45	B	N	1.87	B		140.75			.55			.00	U		7519.57			390.45		

22-316, #13: SW-1 sample location

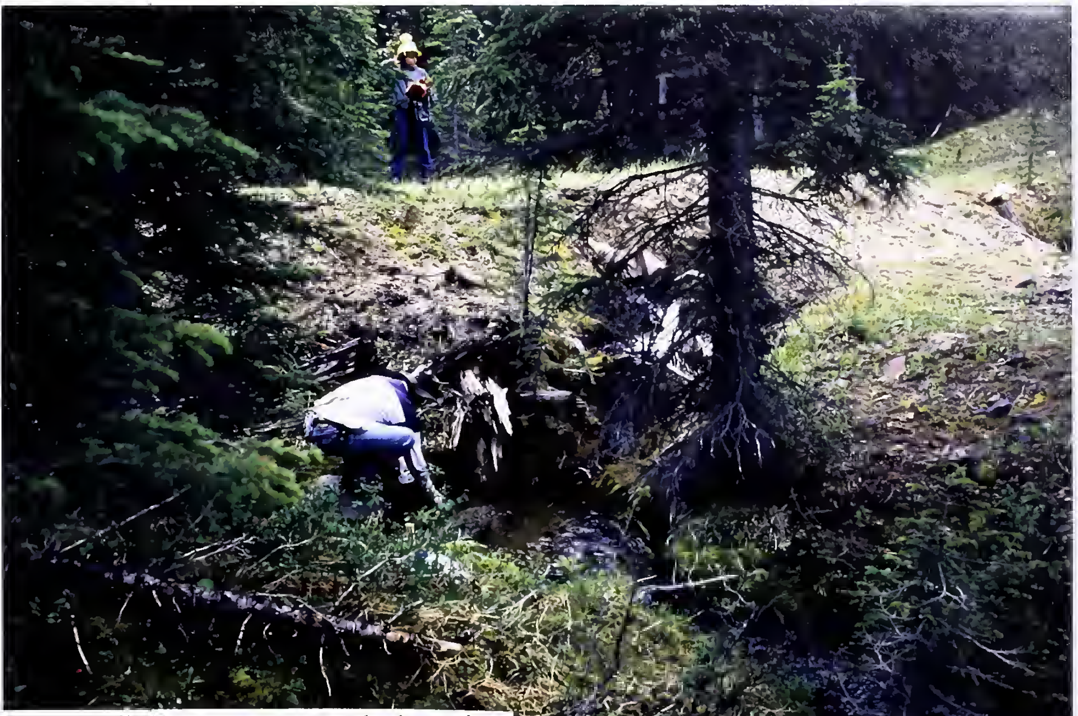

22-316, #14: Adit #1

22-316, #15: WR-1

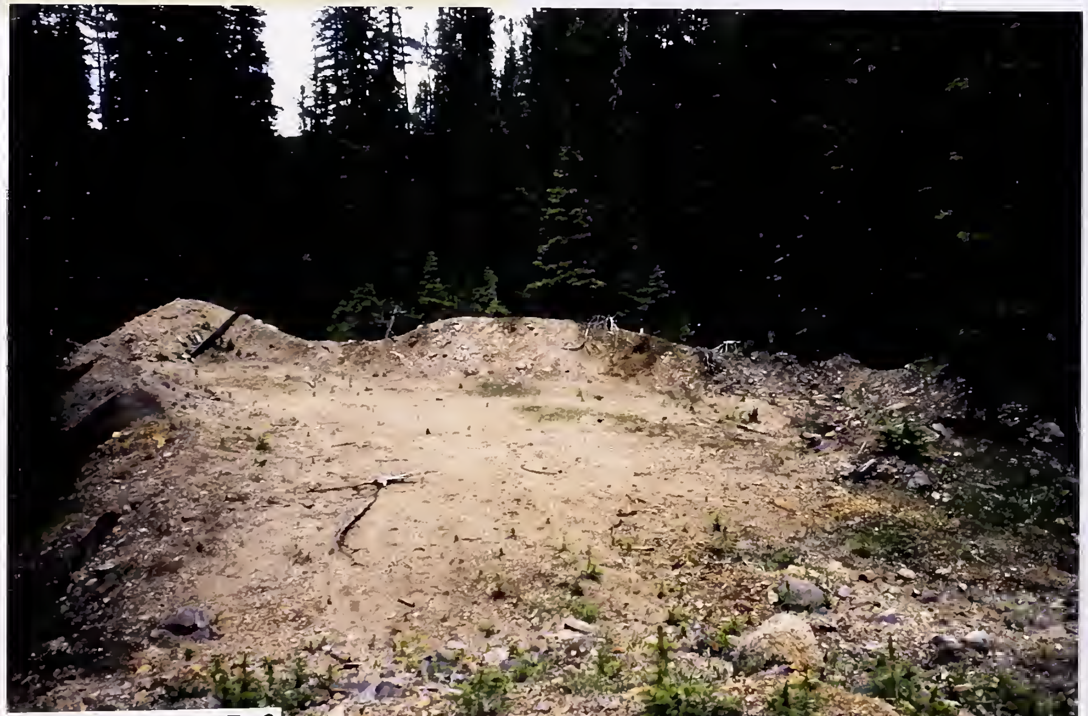

22-316, #16: Collapsed Shaft #1



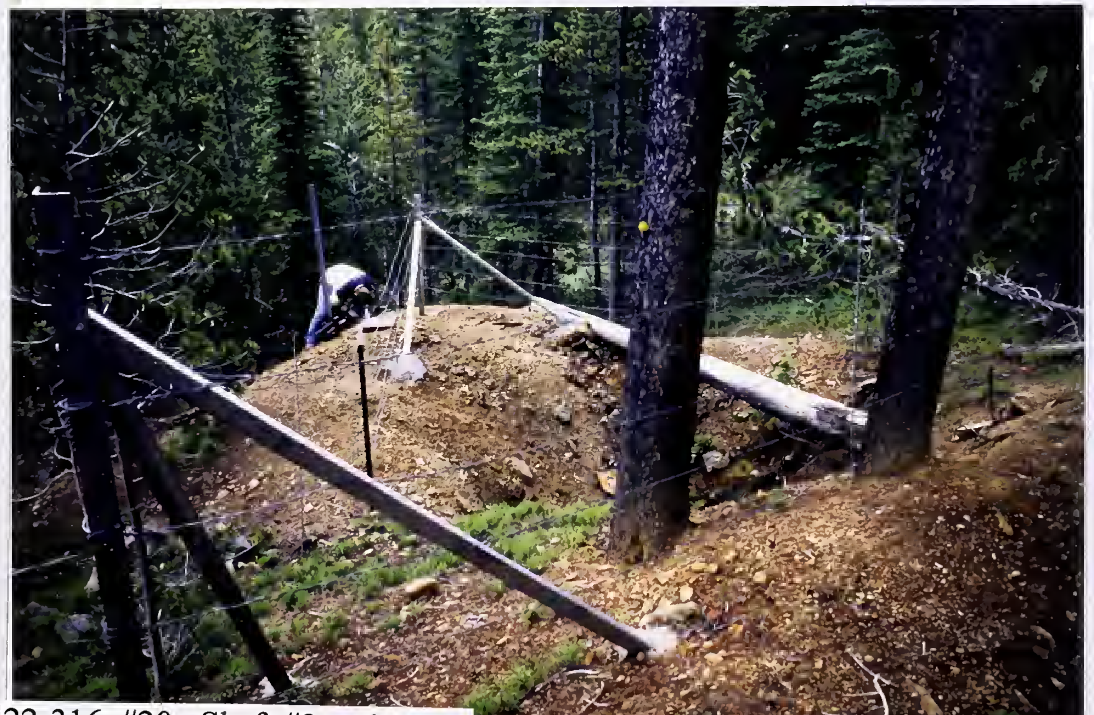
22-316, #17: Collapsed Shaft #2



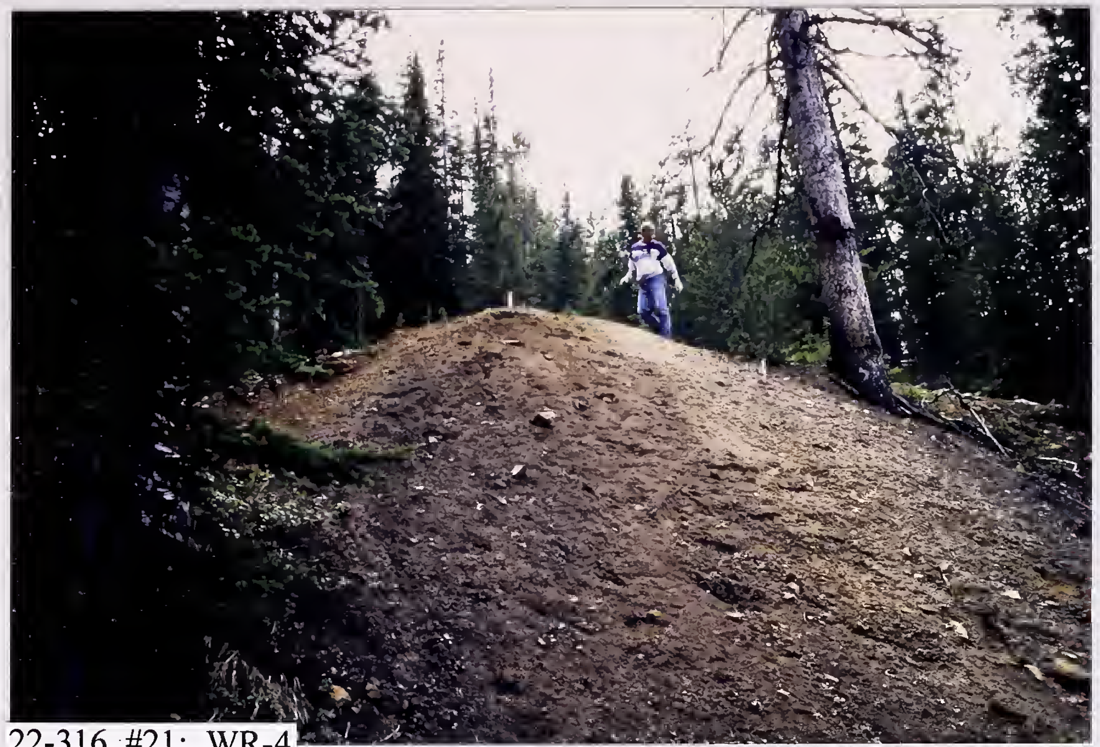
22-316, #18: SW-2 sample location



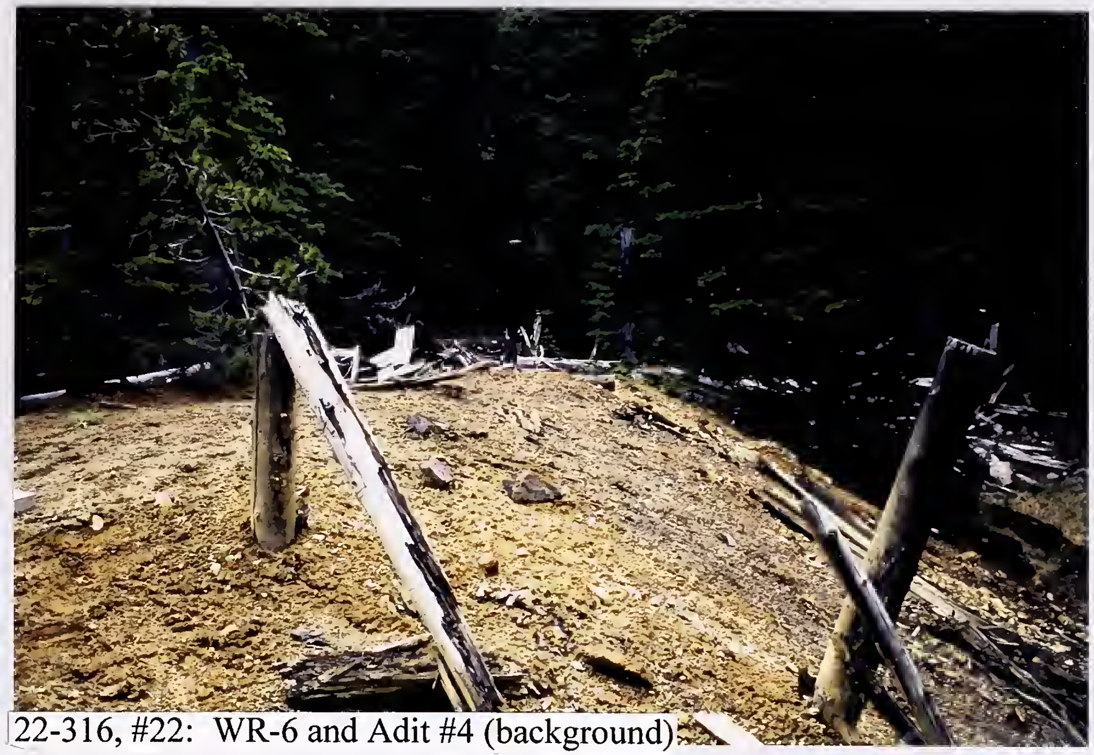
22-316, #19: WR-3



22-316, #20: Shaft #2 and WR-5



22-316, #21: WR-4



22-316, #22: WR-6 and Adit #4 (background)

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: OLD BASIN MILLSITE **PA#:** 22-500

Date: Not Investigated **Time:** N/A

Field Team Leader: Tuesday, Pioneer

Sampling Personnel: N/A

Visitors: N/A

Weather/Seasonality Observations: N/A

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): N/A

General Comments/Observations (not covered specifically in attached Inventory Forms): Data obtained during a 1990 Site Investigation by the EPA has been used to complete this inventory form. The uncontained mining wastes deposits and the close proximity (< 0.25 mile) of these wastes to the town of Basin causes them to be of concern. EPA investigated most of the wastes in 1990. The northwestern part of the Basin site was investigated by MDSL in 1993 (22-036); EPA calls this the Atwater Complex. According to EPA, wastes cover approximately 280,000 square feet. Using this area, an approximate volume of wastes is 10,000 to 30,000 cubic yards.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Isolate mine waste from direct contact by humans and surface water/groundwater interactions.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): OLD BASIN MILLSITE **PA#:** 22-500

Legal Description: **T** 6N **;R** 5W **;Sec.** 17 **,** SW **1/4**____**1/4**____**1/4**
T 6N **;R** 5W **;Sec.** 18 **,** SE **1/4**____**1/4**____**1/4**

County: JEFFERSON **Mining District:** BASIN

Latitude: N 46° 16' 10" **Longitude:** W 112° 16' 46"

Primary Drainage Basin and Code: Boulder River/10020006
Secondary Drainage Basin: Basin Creek

USGS Quadrangle map name(s): Basin

Mine Type/Commodities: Millsite/Gold, Zinc, Copper, Silver, Lead

Activity Status: Active___**,Inactive/Exploration**___**,Abandoned** X **.**

Ownership: Known Y___ **N** X **; private/public?** Private
Owner, Agent, or Contact (Include address and phone when available)**:** Unknown

Relationship to other mines/sites in the area/district: Adjacent to and located within the town of Basin. Includes the Jib Mill tailings, Hope-Katie Mine complex, "Basin" tailings, the smelter in the northeast part of town, and the "WWTP" tailings (SW).

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? Tailings at the Jib Mill complex have been sprayed with a cohesive material to prevent erosional transport of the tailings material. The town of Basin applied for status as a National Register of Historic Places site on June 20, 1978, but it was never formalized.

General site features: Elevation 5355' **, Slope** 5% **,**
Aspect East to South

Land use: Mining___**, Recreational** X **, Residential** X **, Urban**___**,**
Agricultural___**, Other(Specify)**___

Area of disturbed/unvegetated lands? Approx. 150 **acre(s).**
Site Dimensions: 2,000 feet x 5,000 feet

Predominant vegetation types: Douglas fir/Lodgepole pine forests surrounding the area; weeds and some grassess pioneering on mine wastes.

Access: roads - good (paved) X **,poor (maintained dirt road)**___**,**
4wd___**,trail**___**.**
Other logistical considerations (proximity to other sites).___

Well logs within 1 mile radius; **(Attach MBMG Well Log Printout(s):** There are 21 wells reported within a 1 mile radius. According to EPA, there are 10 private wells in Basin and 1 community well.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). The town of Basin is situated on top of river deposits of sand and gravel. Primary geologic feature is the Boulder batholith. Groundwater flow direction is probably eastward, paralleling the flow of the Boulder River. Klein smith Gulch flows north into the Boulder River on the southwest side of Basin. Cataract Creek flows south and joins the Boulder River approximately one mile east of Basin.

Mining/milling history, ore type/tenor, host rock, gangue: The Jib Mill was constructed in 1882 and burned in 1896. It was rebuilt and operated in the 1930s and burned again in 1975. The Atwater was built in 1915. The Jib operation recovered $3,000,000 worth of ore. The Atwater complex was built on the east end of Basin in 1915.

Mine Operation?

Shafts -	**Yes** X	**No**	**#**	**Comment**
Adits -	**Yes** X	**No**	**#**	**Comment**
Pits -	**Yes**	**No** X	**#**	**Comment**
Placers -	**Yes**	**No** X	**#**	**Comment**
Other -	**Yes**	**No** X	**#**	**Comment**

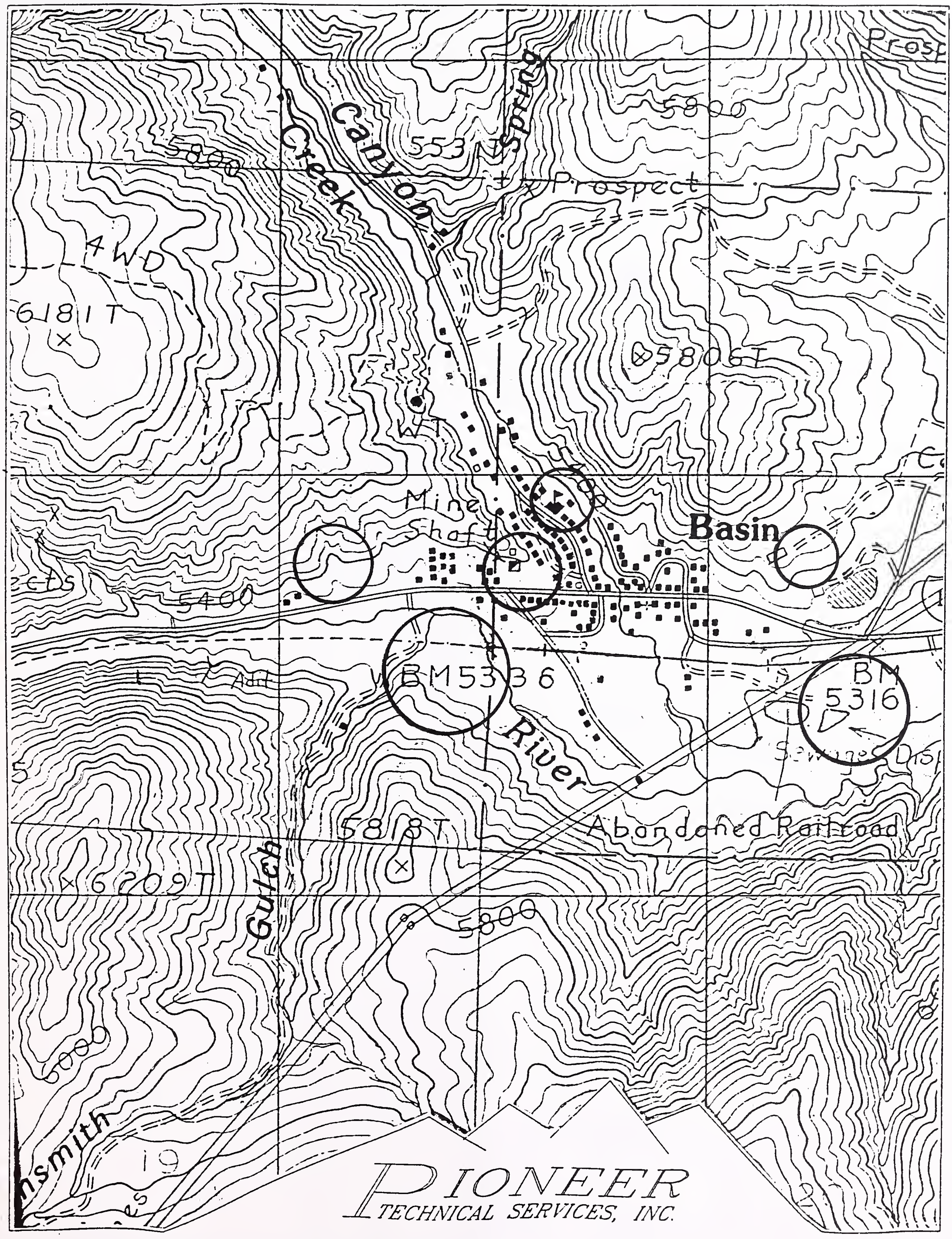
Mill Operation? Yes X **, No**____. **If yes answer the next three questions:**

Period(s) of Operation: 1882 to 1896 and 1930s to 1975 (Jib Mill)

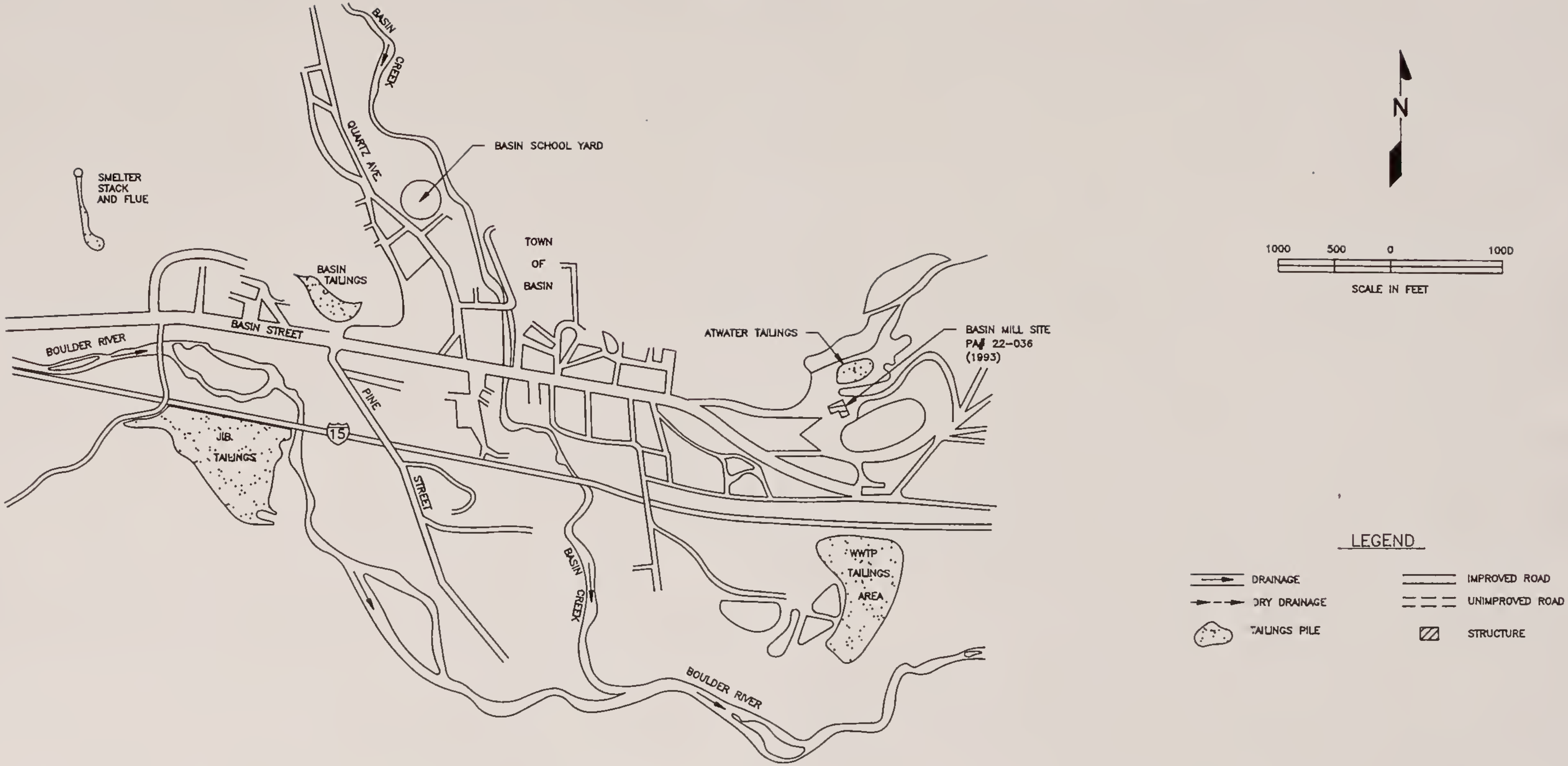
Origin of Ore Milled - Custom Mill___ **Dedicated Mill** X **; Number and names of mines that supplied mill feed:** Katie Hope and White Elephant Mines (Jib Mill); The Atwater complex used an acid leaching and electrolytic precipitation process.

Process? Hg-amalgam, CN⁻ leach (vat, heap), floatation, smelting? Gravity floatation in 1923; in 1933, it is reported that a modern floatation facility was built. The Atwater was utilized to extract zinc from tailings using acid leaching and electrolytic precipitation.

Well No.	Location	Depth	Yield	Static Water Level
M:53425	06N 05W 17	45.0	15.0	8.00
M:53423	06N 05W 17	110.0	10.0	20.00
M:53422	06N 05W 17	25.0	60.0	15.00
M:53424	06N 05W 17	28.0	5.0	20.00
M:135002	06N 05W 17 ACA	397.0	9.0	36.00
M:53427	06N 05W 17 CB	0.0	2.0	15.00
M:131806	06N 05W 17 CBA	31.0	20.0	16.00
M:53426	06N 05W 17 CCB	30.0	500.0	4.00
M:53428	06N 05W 17 DB	123.0	8.0	30.00
M:53429	06N 05W 18	27.0	60.0	14.00
M:53432	06N 05W 18	30.0	30.0	10.00
M:53433	06N 05W 18	16.0	20.0	0.00
M:53431	06N 05W 18	21.0	20.0	5.00
M:53434	06N 05W 18	40.0	20.0	38.00
M:53430	06N 05W 18	25.0	65.0	25.00
M:138495	06N 05W 18 ACB	50.0	150.0	21.44
M:138497	06N 05W 18 ACB	51.0	150.0	21.90
M:53435	06N 05W 18 ADA	100.0	200.0	17.00
M:132795	06N 05W 18 DAD	45.0	125.0	20.00
M:53420	06N 05W 07 DCB	25.0	30.0	10.00
M:53445	06N 06W 13 DD	90.0	12.0	65.00



OLD BASIN MILLSITE, P.A. NO. 22-500
T08N. R13W. SECTIONS 17 & 18
SCALE: 1" = 1000'



DRAWN FOR:

PIONEER
TECHNICAL SERVICES, INC.

TITLE:

OLD BASIN MILL SITE
PA# 22-500

DRAWING NO.: PT340260 REV: –
DATE: 12/3/94 PLOT SCALE: 1 = 1000

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. **Waste Characteristics** - *Use table on following page.*

Unique source identification: (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures/vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. **TAILINGS IMPOUNDMENTS** - *If tailings impoundments are also present, complete the following questions.*

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: ____________________

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.									

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: ____________________

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No_X_, Number:____ Identification:______________

Filled shafts: Yes___, No_X_, Number:____ Identification:______________

Seeps/Springs: Yes___, No_X_, Number:____ Identification:______________

Groundwater wells within 4 miles?: Yes_X_, No___;
Number of well logs: 52 (EPA reports 451 people)

Distance to nearest well used for drinking:
_X_<1,000 ft;___1,000 ft to 0.5 miles;___>0.5 miles.

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, **Probable**_X__, **Possible**____, **Unlikely**____.
Uncontained sources, shallow groundwater, and highly permeable alluvium

Approximate Depth to Groundwater: _X_<25 ft;___ 25 - 100 ft;___ >100 ft.

Other observations/notes: Approximate Depth to Groundwater is 20 feet according the 1990 EPA report (EPA ID MTD 981550148).

GROUNDWATER INVENTORY FORM

SAMPLERS: ____________________

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC $\mu S/cm$ @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.												

FLOW: Estimated (E) or Measured (M) from edit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ____________________

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: **Yes** X , **No**____, **Name(s):** Basin Creek and Boulder River

Dry streambeds: **Yes**____, **No** X , **Name(s):**

Other surface water: **Yes**____, **No** X , **Name(s)/Description:**

Waste materials within any floodplain: **Yes** X , **No**___ **Source ID(s):** Jib tailings, WWTP tailings

Approximate Flood frequency? X **1 yr**, ___**10 yr**, ___**100 yr**

Estimated seasonal flow of stream(s) (cfs/gpm)? 100 cfs
High Flow: 1,000 cfs , **Average Flow:** 119 cfs

Distance between waste source(s) and nearest surface water body (ft)? In some locations 0 feet

Surface water draining onto or through waste sources: **Yes**____, **No** X ,
Describe:

Surface water use within 15 miles downstream? **(Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)** Wetlands, riparian, irrigation, agriculture, fishery.

Observed erosional/sedimentation/stream turbidity problems? Yes_____, **No** X . **Distance downstream (ft)? 0-500**___; **500-1,000**___; **>1,000**___.
Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):

SURFACE WATER INVENTORY FORM

SAMPLERS: ______

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC $\mu S/cm$ @ 25°C	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.										

*FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ______

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides? (SO_3)

Presence of evaporative salt deposits? (ESD)

Discolored or turbid seepage? (SPG)

Presence of long filamentous algae in drainages, mosses in moist areas?

Presence of ferric hydroxide precipitates? (FEOX)

Presence of burned or stressed vegetation? (VEG)

pH ≤ 5.0 (pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 20 acres

Wetlands present: Yes X **, No** ___ **, Describe:** Boulder River

Carbonate rocks/soils: Yes ___ **, No** X **, Describe:** ___

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30___; 30-100___; 100-300___; 300-1,000 X **; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments** ___

Nearest residence: X **<1,000 ft;___1,000 ft - 0.5 miles;___>0.5 miles.**

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: ______

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
No samples were taken.						

Notes and Clarifications: ______

______

______

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes_X_, No____,
Describe:________________________________

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___; 300-1,000_X_; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments________________________________

Evidence of recreational use on site: Yes_X_, No___, Describe:________

Accessibility (check each that apply):_X_Easily accessible - no fences, gates, or warning signs;___Moderately Accessible - barbed wire fences, road gated, or signs posted;___Difficult Access - chain-link fence, road gated and locked, site guarded (does not include locked or manned access points located more than 0.5 miles from the actual site).

Sensitive environments on-site or adjacent to site:
State or National Parks - Yes___, No_X_, Comment________
Wilderness Area - Yes___, No_X_, Comment________
T&E Species Habitat - Yes___, No_X_, Comment________
Bat Habitat - Yes___, No_X_, Comment________

Primary Drainage___; Secondary Drainage_X_; No Information___:
Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium_X_, Low___
Fisheries Habitat and Species Classification - _4_
Sport Fishery Classification - _4_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, No___, Number____, types and locations:___
Shafts and adits in the area; not quantified.

Hazardous structures: Yes_X_, No___, Number_2_, types and locations:_
Smelter, loadout

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____, types and locations:________________________________

Unstable waste piles, impoundments, undercut banks: Yes____, No_X_, Number____, types and locations:________________________________

Fire and/or Explosion hazards: Yes___, No_X_, Explain:________________

Bibliography

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USEPA, Analytical Results Report for the Basin Mining Site, Basin, Montana, EPA ID MTD981550148, Prepared by Ecology and Environment, November 10, 1989.

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USEPA, Memorandum Regarding the Trip Report for Basin School Yard, TDD #TO8-8912-013, To Steve Hawthorn, EPA/ERB - Denver, From Melissa Haines, Ecology and Environment, February 2, 1990.

USEPA, Sampling Plan for the Basin Mining Site, Basin, Montana, EPA ID MTD981550148, Prepared by Ecology and Environment, June 16, 1989.

USGS, Topographic Map, Basin, Montana, 7 1/2 minute Quadrangle, 1985.

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

OLD BASIN MILLSITE
PA NO. 22-500

AIMSS SCORESHEET

SITE NAME: Old Basin Millsite
PA NUMBER: 22-500

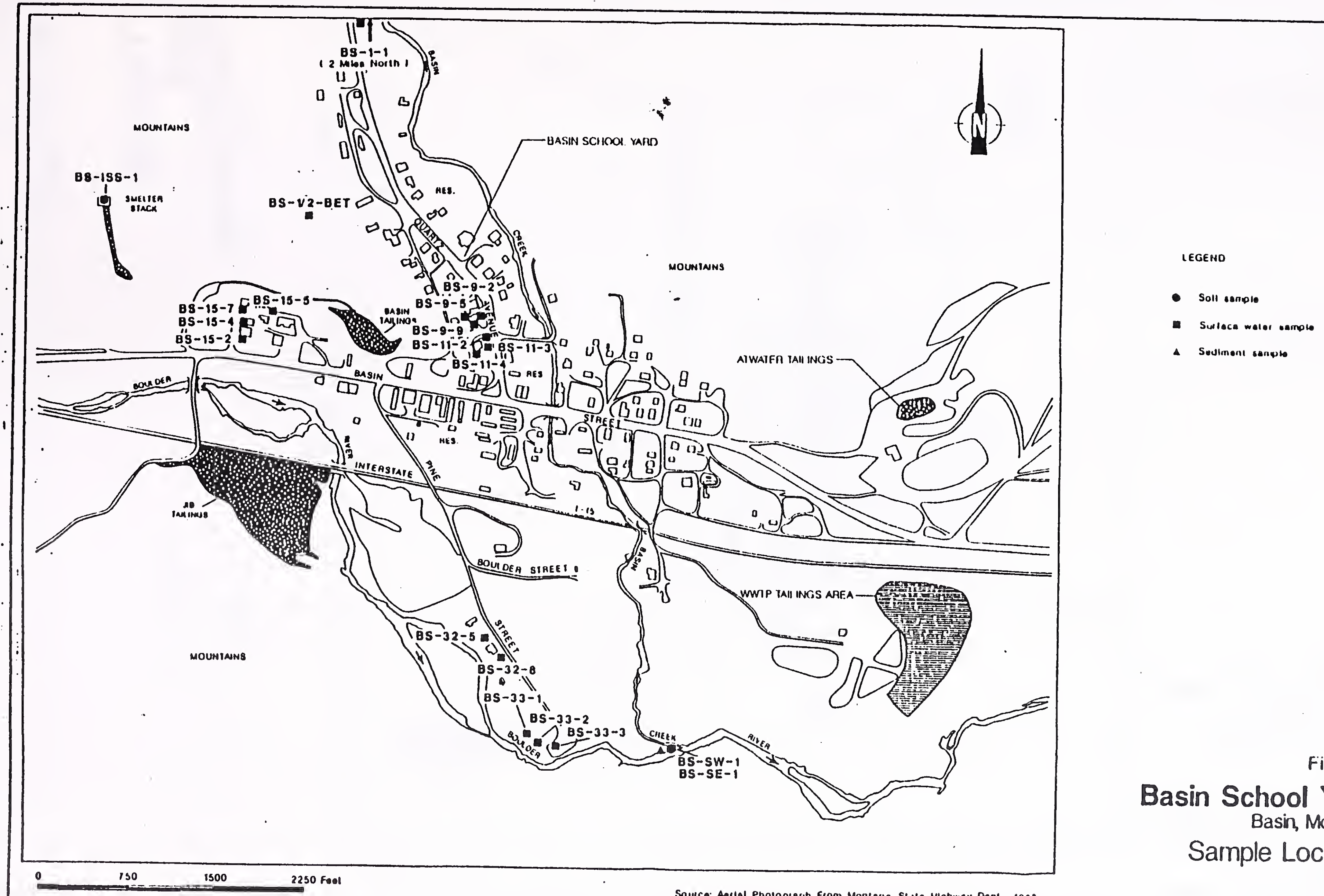
LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	13.505
6	GW - TARGETS	WELLS - 1 MI. x 2.5		52.5
7		WELLS - 1 TO 4 MI		11
8		NEAREST WELL		10
9		TARGETS SCORE	LINES 6 + 7 + 8	73.5
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	397047
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		300
12		EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	700
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	14.839
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19		FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	18
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	186971
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		10
26B		DISTANCE TO POPULATION		20
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	200
27		LIKELIHOOD SCORE	LINES 25 + 26C	200
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.484
29	AIR - TARGETS	POPULATION - 4 MILES		300
30		NEAREST RESIDENCE		10
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	320
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	94976
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		250
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		20
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	400
38		LIKELIHOOD SCORE	LINES 36 + 37C	650
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.351
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		300
41		NEAREST RESIDENCE		10
42		RECREATIONAL USE		10
43		TARGETS SCORE	SUM LINES 40 THRU 42	320
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	281008
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE (LINES 10 + 24 + 35 + 44) / 100,000			9.60

SITE NAME: Old Basin Millsite
PA NUMBER: 22-500

SITE SAFETY

LINE NO.				
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	40
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	40
9		POPULATION - 1 MILE		300
10	TARGETS	NEAREST RESIDENCE		10
11		RECREATIONAL USE		10
12		TARGETS SCORE	SUM LINES 9 THRU 11	320
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	256.00

SUMMARY OF HISTORICAL ANALYTICAL DATA
FROM OTHER SOURCES



Source: Aerial Photograph From Montana State Highway Dept., 1983

Figure 2

Basin School Yard

Basin, Montana

Sample Location Map

SOURCE : Ecology & Environment, Inc

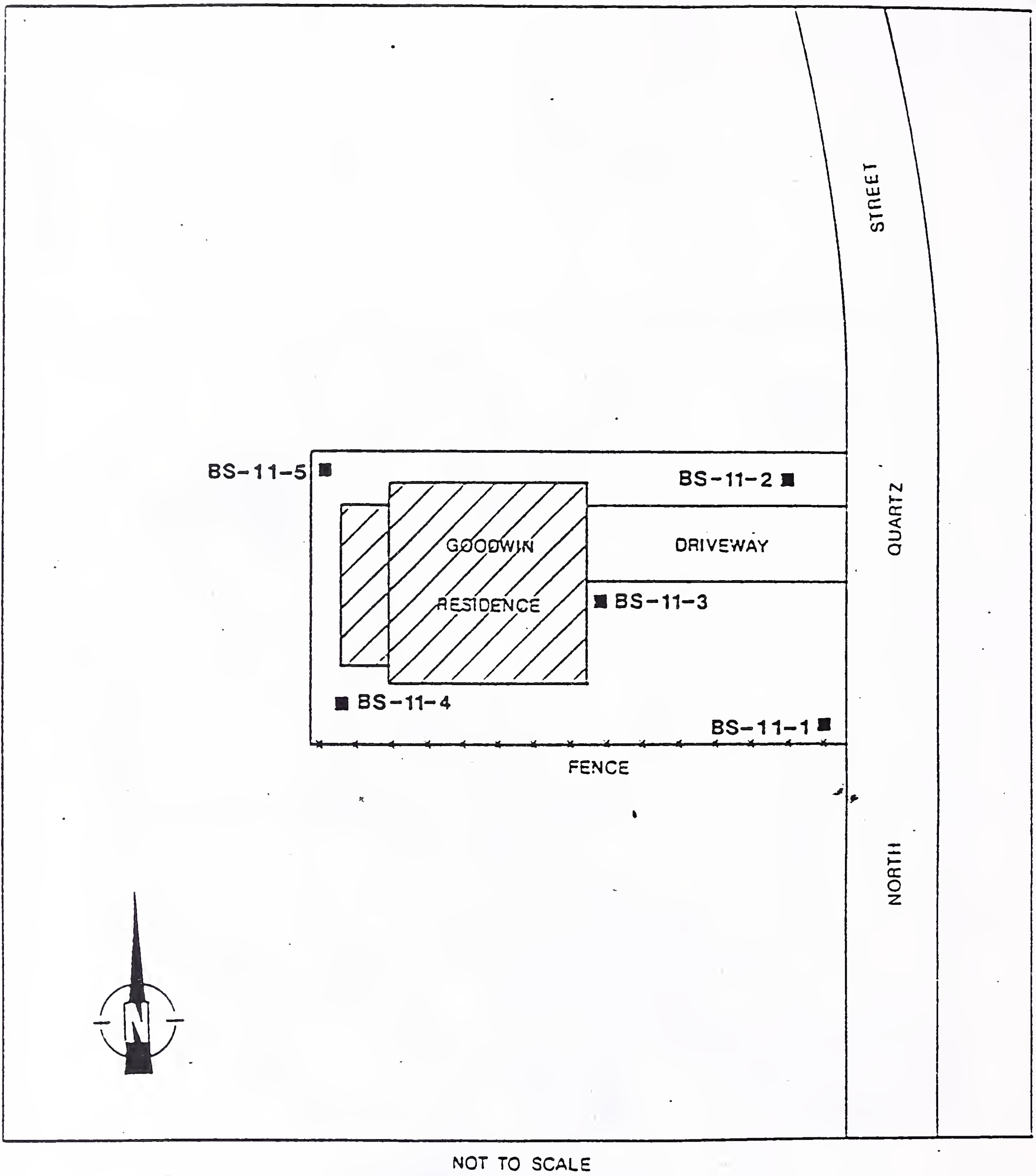


Figure 3

Basin School Yard

Basin, Montana

Sample Location Map

BS-11-1, BS-11-2, BS-11-3, BS-11-4 & BS-11-5

SOURCE : Ecology & Environment, Inc.

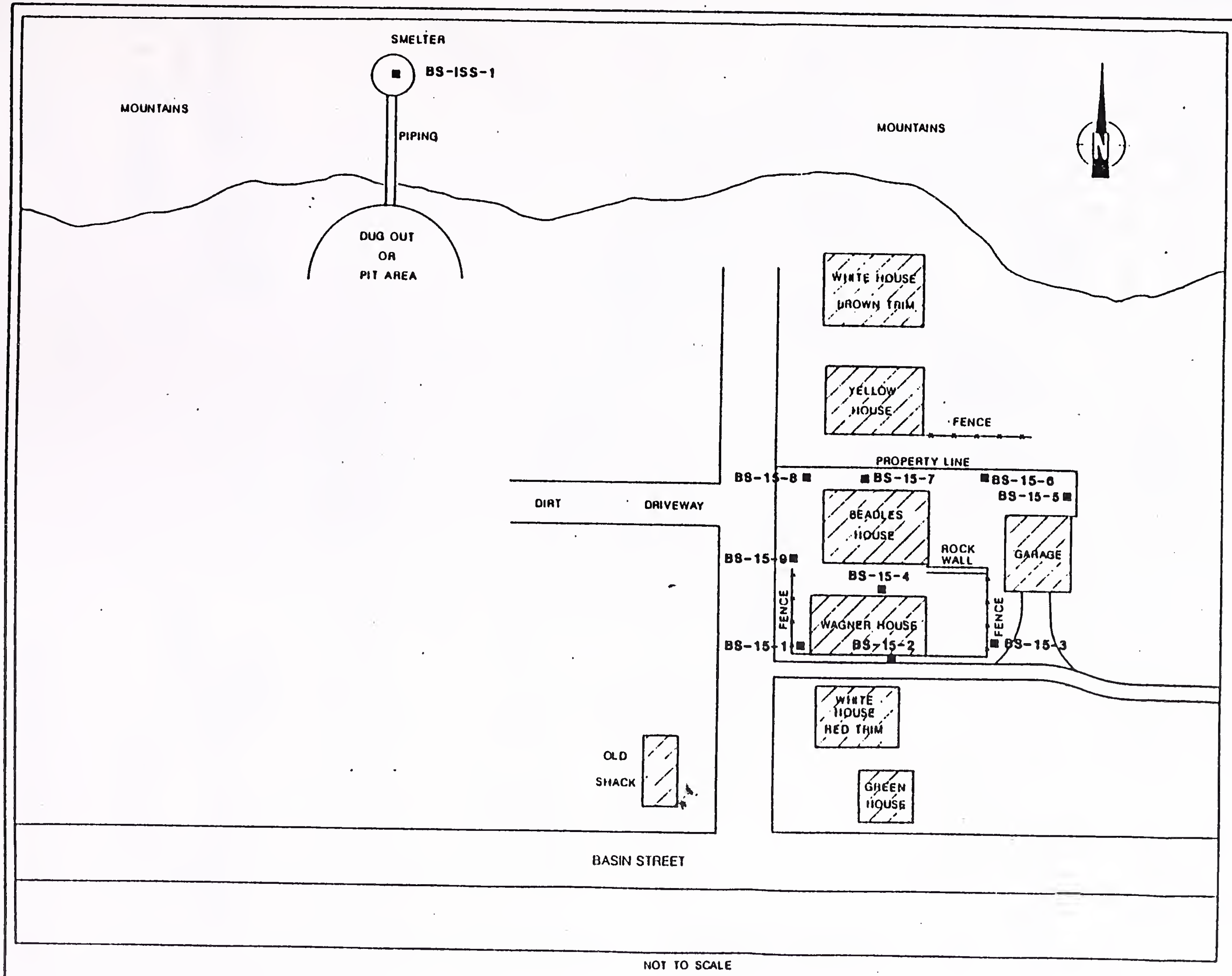


Figure 4

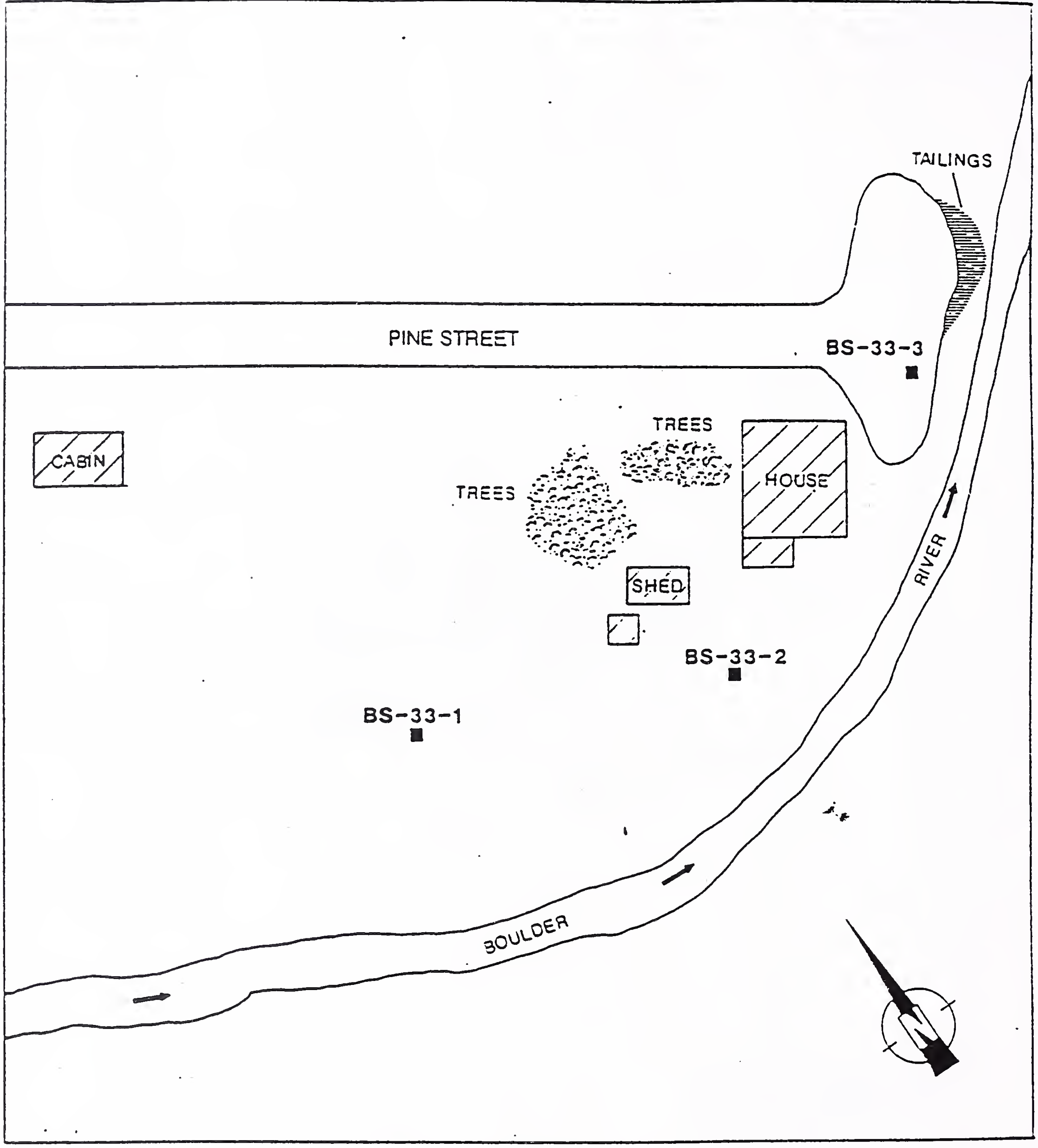
Basin School Yard

Basin, Montana

Sample Location Map

BS-15-1, BS-15-2, BS-15-3, BS-15-4, BS-15-5, BS-15-6, BS-15-7, BS-15-8, BS-15-9 &BS-ISS-1

SOURCE : Ecology & Environment Inc



NOT TO SCALE

LEGEND

■ Soil sample

Figure 5

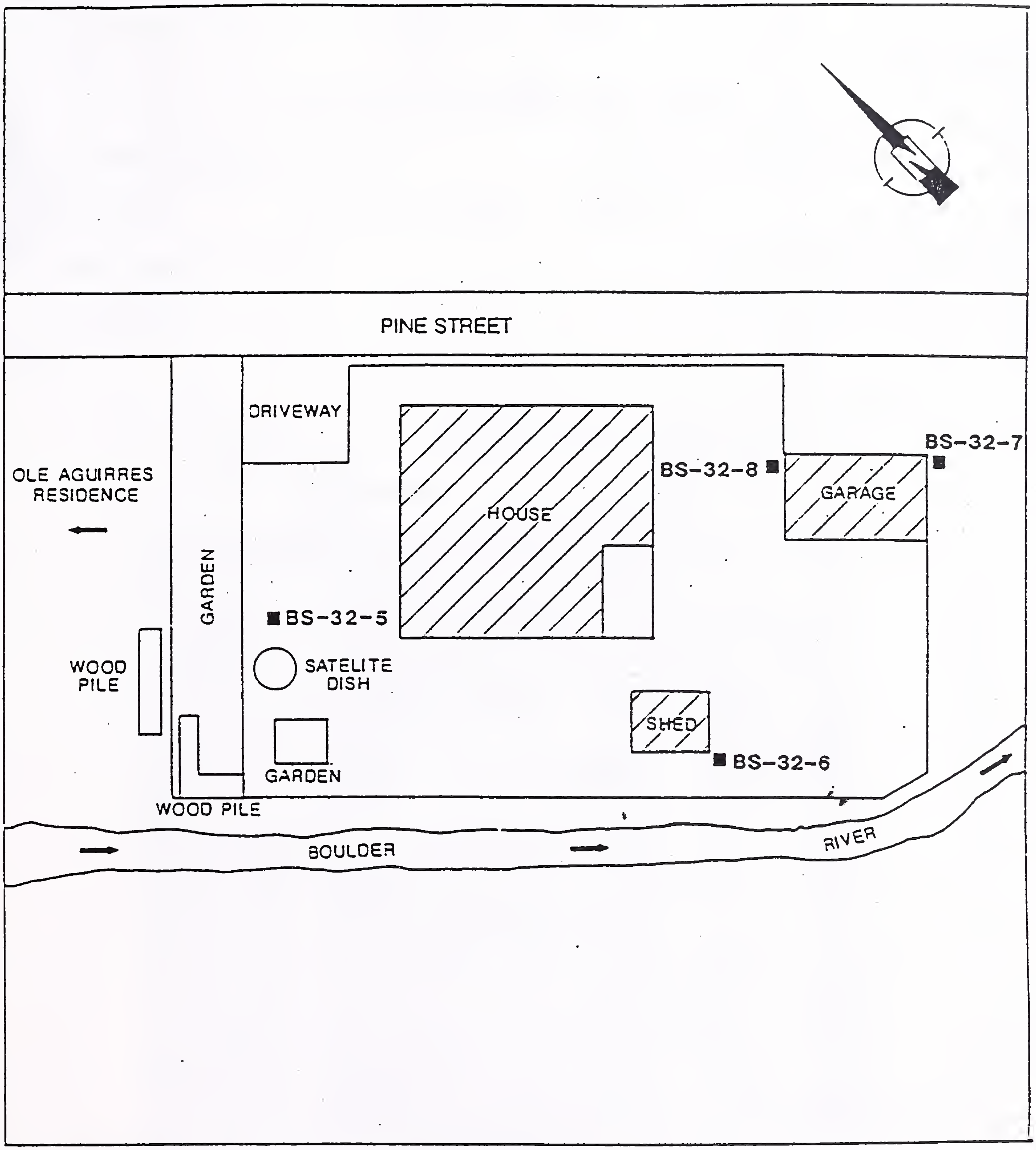
Basin School Yard

Basin, Montana

Sample Location Map

BS-33-1, BS-33-2, & BS-33-3

SOURCE : Ecology & Environment, Inc.



NOT TO SCALE

LEGEND

■ Soil sample

Figure 6

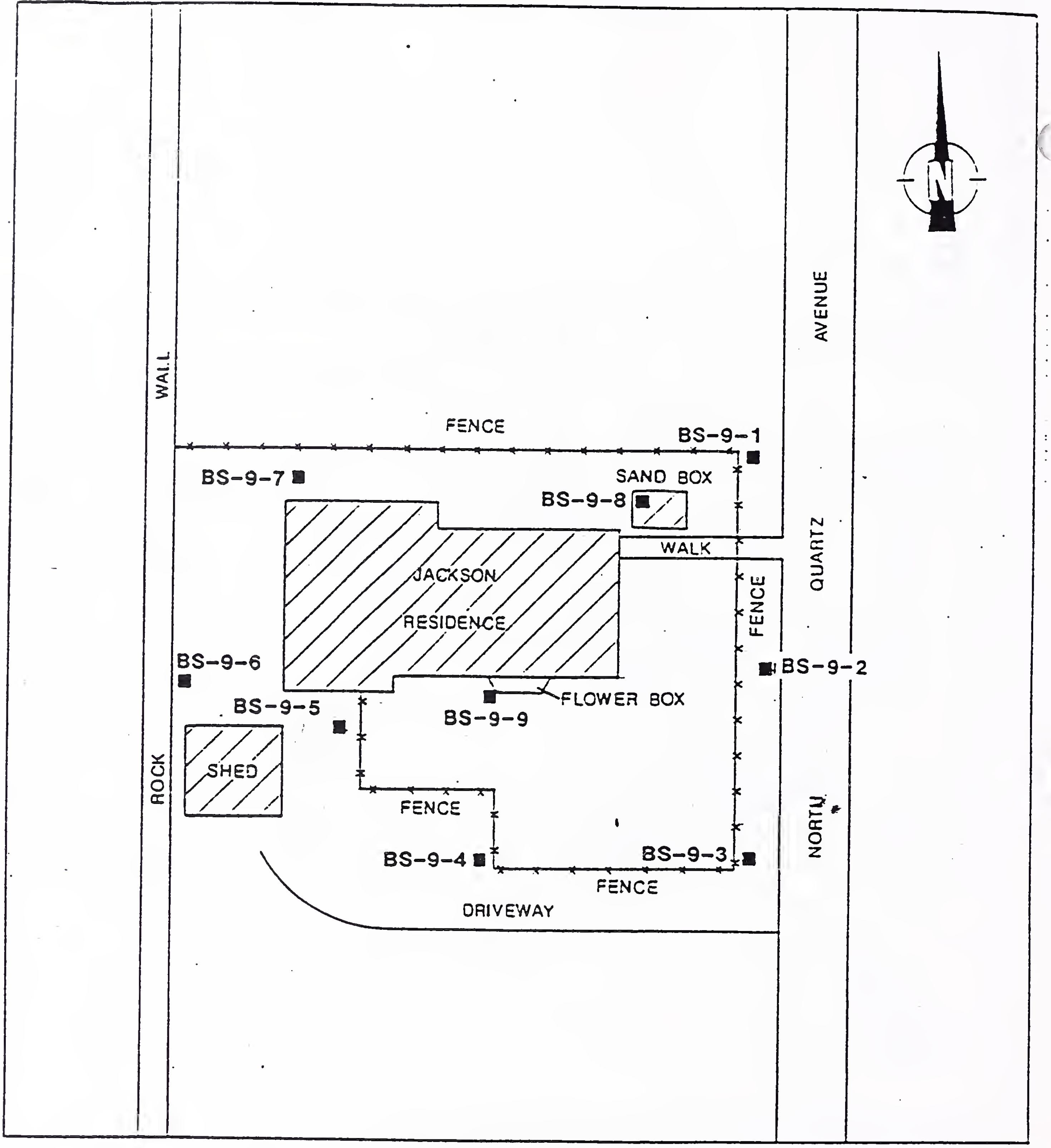
Basin School Yard

Basin, Montana

Sample Location Map

BS-32-5, BS-32-6, BS-32-7,
& BS-32-8

SOURCE : Ecology & Environment, Inc.



NOT TO SCALE

LEGEND

■ Soil sample

Figure 7

Basin School Yard

Basin, Montana

Sample Location Map

BS-9-1, BS-9-2, BS-9-3, BS-9-4,
BS-9-5, BS-9-6, BS-9-7,
BS-9-8, & BS-9-9

SOURCE : Ecology & Environment, Inc.

U.S. EPA - CLP

1A
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHT750

Lab Name: WEYERHAEUSER COMPANY   Contract: 68-D9-0080

Lab Code: WEYER   Case No.: 17014   SAS No.:   SDG No.: MHT750

Matrix (soil/water): SOIL   Lab Sample ID: 76630

Level (low/med): LOW   Date Received: 08/26/91

% Solids: 96.8

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	13500			P	
7440-36-0	Antimony	4.4	U	N	P	UJ
7440-38-2	Arsenic	19.9			F	
7440-39-3	Barium	283			P	
7440-41-7	Beryllium	1.1			P	
7440-43-9	Cadmium	0.48	B		P	
7440-70-2	Calcium	4540			P	
7440-47-3	Chromium	14.6		*	P	
7440-48-4	Cobalt	9.3	B		P	
7440-50-8	Copper	47.9			P	
7439-89-6	Iron	17400		*	P	
7439-92-1	Lead	26.9			P	
7439-95-4	Magnesium	4100			P	
7439-96-5	Manganese	817			P	
7439-97-6	Mercury	0.04	U		CV	UJ
7440-02-0	Nickel	14.0			P	
7440-09-7	Potassium	2280			P	
7782-49-2	Selenium	0.38	U	NW	F	UJ
7440-22-4	Silver	0.60	U		P	
7440-23-5	Sodium	90.1	B		P	
7440-28-0	Thallium	0.25	B		F	
7440-62-2	Vanadium	31.8		E*	P	
7440-66-6	Zinc	75.4			P	
	Cyanide				NR	

4/2/92
EGD

Color Before: BROWN   Clarity Before: Texture: FINE

Color After: BROWN   Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

EPA SAMPLE NO.

1b

INORGANIC ANALYSIS DATA SHEET

MHT750

Lab Name: WEYERHAEUSER COMPANY Contract: 68-D9-0080

Lab Code: WEYER Case No.: 17014 SAS No.: SDG No.: MHT750

Matrix (soil/water): SOIL Lab Sample ID: 76630

Level (low/med): LOW Date Received: 08/26/91

% Solids: 96.8

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead	26.8			F
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury				NR
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

7/2/98
86D

Color Before: BROWN Clarity Before: Texture: FINE

Color After: BROWN Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHT751

Lab Name: WEYERHAEUSER COMPANY Contract: 68-D9-0080

Lab Code: WEYER Case No.: 17014 SAS No.: SDG No.: MHT750

Matrix (soil/water): SOIL Lab Sample ID: 76631

Level (low/med): LOW Date Received: 08/26/91

% Solids: 81.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	6690			P	
7440-36-0	Antimony	7.0	B	N	P	
7440-38-2	Arsenic	22.5			F	
7440-39-3	Barium	280			P	
7440-41-7	Beryllium	0.65	B		P	
7440-43-9	Cadmium	1.1	B		P	
7440-70-2	Calcium	10200			P	
7440-47-3	Chromium	20.4		*	P	
7440-48-4	Cobalt	4.2	B		P	
7440-50-8	Copper	101			P	
7439-89-6	Iron	13100		*	P	
7439-92-1	Lead	804			P	
7439-95-4	Magnesium	2060			P	
7439-96-5	Manganese	462			P	
7439-97-6	Mercury	0.75			CV	J
7440-02-0	Nickel	6.1	B		P	
7440-09-7	Potassium	1990			P	
7782-49-2	Selenium	0.45	U	NW	F	UJ
7440-22-4	Silver	1.8	B		P	
7440-23-5	Sodium	202	B		P	
7440-28-0	Thallium	0.22	U		F	
7440-62-2	Vanadium	13.4		E*	P	
7440-66-6	Zinc	310			P	
	Cyanide				NR	

4/2/92
EG

Color Before: BROWN Clarity Before: Texture: FINE

Color After: BROWN Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

1D

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHT752

Lab Name: WEYERHAEUSER COMPANY   Contract: 68-D9-0080

Lab Code: WEYER   Case No.: 17014   SAS No.:   SDG No.: MHT750

Matrix (soil/water): SOIL   Lab Sample ID: 76632

Level (low/med): LOW   Date Received: 08/26/91

% Solids: 90.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	10600			P	
7440-36-0	Antimony	4.6	U	N	P	UJ
7440-38-2	Arsenic	20.2			F	
7440-39-3	Barium	230			P	
7440-41-7	Beryllium	0.76	B		P	
7440-43-9	Cadmium	1.8			P	
7440-70-2	Calcium	6270			P	
7440-47-3	Chromium	11.5		*	P	
7440-48-4	Cobalt	4.1	B		P	
7440-50-8	Copper	58.9			P	
7439-89-6	Iron	12700		*	P	
7439-92-1	Lead	309			P	
7439-95-4	Magnesium	2600			P	
7439-96-5	Manganese	461			P	
7439-97-6	Mercury	0.21			CV	J
7440-02-0	Nickel	7.3	B		P	
7440-09-7	Potassium	2430			P	
7782-49-2	Selenium	0.42	U	N	F	UJ
7440-22-4	Silver	0.63	U		P	
7440-23-5	Sodium	280	B		P	
7440-28-0	Thallium	0.25	B		F	
7440-62-2	Vanadium	20.6		E*	P	
7440-66-6	Zinc	440			P	
	Cyanide				NR	

4/2/92

Color Before: BROWN   Clarity Before: Texture: FINE

Color After: BROWN   Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

1b

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHT753

Lab Name: WEYERHAEUSER COMPANY   Contract: 68-D9-0080

Lab Code: WEYER   Case No.: 17014   SAS No.:   SDG No.: MHT750

Matrix (soil/water): SOIL   Lab Sample ID: 76633

Level (low/med): LOW   Date Received: 08/26/91

% Solids: 98.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	12500			P	
7440-36-0	Antimony	4.2	U	N	P	UJ
7440-38-2	Arsenic	43.9			F	
7440-39-3	Barium	215			P	
7440-41-7	Beryllium	1.0			P	
7440-43-9	Cadmium	1.3			P	
7440-70-2	Calcium	5180			P	
7440-47-3	Chromium	23.4		*	P	
7440-48-4	Cobalt	6.0	B		P	
7440-50-8	Copper	71.7			P	
7439-89-6	Iron	26600		*	P	
7439-92-1	Lead	186			P	
7439-95-4	Magnesium	3590			P	
7439-96-5	Manganese	594			P	
7439-97-6	Mercury	0.20			CV	
7440-02-0	Nickel	11.2			P	
7440-09-7	Potassium	3130			P	
7782-49-2	Selenium	0.39	U	N	F	UJ
7440-22-4	Silver	0.57	U		P	
7440-23-5	Sodium	151	B		P	
7440-28-0	Thallium	0.29	B		F	
7440-62-2	Vanadium	58.8		E*	P	
7440-66-6	Zinc	318			P	
	Cyanide				NR	

4/2/92
EGD

Color Before: BROWN   Clarity Before: Texture: FINE

Color After: BROWN   Clarity After: Artifacts:

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHT754

Lab Name: WEYERHAEUSER COMPANY Contract: 68-D9-0080

Lab Code: WEYER Case No.: 17014 SAS No.: SDG No.: MHT750

Matrix (soil/water): SOIL Lab Sample ID: 76634

Level (low/med): LOW Date Received: 08/26/91

% Solids: 99.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	15000			P	
7440-36-0	Antimony	4.2	U	N	P	UJ
7440-38-2	Arsenic	13.4			F	
7440-39-3	Barium	338			P	
7440-41-7	Beryllium	1.2			P	
7440-43-9	Cadmium	1.9			P	
7440-70-2	Calcium	9730			P	
7440-47-3	Chromium	13.1		*	P	
7440-48-4	Cobalt	8.0	B		P	
7440-50-8	Copper	55.1			P	
7439-89-6	Iron	15600		*	P	
7439-92-1	Lead	863			P	
7439-95-4	Magnesium	5360			P	
7439-96-5	Manganese	648			P	
7439-97-6	Mercury	0.04	U		CV	UJ
7440-02-0	Nickel	12.5			P	
7440-09-7	Potassium	4300			P	
7782-49-2	Selenium	0.38	U	NW	F	UJ
7440-22-4	Silver	0.57	U		P	
7440-23-5	Sodium	1090			P	
7440-28-0	Thallium	0.25	B		F	
7440-62-2	Vanadium	27.1		E*	P	
7440-66-6	Zinc	455			P	
	Cyanide				NR	

4/8/9

Color Before: BROWN Clarity Before: Texture: FINE

Color After: BROWN Clarity After: Artifacts:

Comments:

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EPA SAMPLE NO.

1G

INORGANIC ANALYSIS DATA SHEET

MHT755

Lab Name: WEYERHAEUSER COMPANY Contract: 68-D9-0080

Lab Code: WEYER Case No.: 17014 SAS No.: SDG No.: MHT750

Matrix (soil/water): SOIL Lab Sample ID: 76635

Level (low/med): LOW Date Received: 08/26/91

% Solids: 81.9

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	10500			P	
7440-36-0	Antimony	48.5		N	P	J
7440-38-2	Arsenic	41.4			F	
7440-39-3	Barium	403			P	
7440-41-7	Beryllium	0.84	B		P	
7440-43-9	Cadmium	3.7			P	
7440-70-2	Calcium	5070			P	
7440-47-3	Chromium	14.1		*	P	
7440-48-4	Cobalt	6.2	B		P	
7440-50-8	Copper	93.2			P	
7439-89-6	Iron	17500		*	P	
7439-92-1	Lead	4980			P*	
7439-95-4	Magnesium	3600			P	
7439-96-5	Manganese	336			P	
7439-97-6	Mercury	0.32			CV	J
7440-02-0	Nickel	8.7	B		P	
7440-09-7	Potassium	2700			P	
7782-49-2	Selenium	0.80	B	N	F	J
7440-22-4	Silver	0.70	U		P	
7440-23-5	Sodium	247	B		P	
7440-28-0	Thallium	0.23	U		F	
7440-62-2	Vanadium	26.9		E*	P	
7440-66-6	Zinc	918			P	
	Cyanide				NR	

4/2/98
EGD

Color Before: BROWN Clarity Before: Texture: FINE

Color After: BROWN Clarity After: Artifacts:

Comments:

15-5

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHT756

Lab Name: WEYERHAEUSER COMPANY   Contract: 68-D9-0080

Lab Code: WEYER   Case No.: 17014   SAS No.:   SDG No.: MHT750

Matrix (soil/water): SOIL   Lab Sample ID: 76636

Level (low/med): LOW   Date Received: 08/26/91

% Solids: 98.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	12400			P
7440-36-0	Antimony	4.4	U	N	P
7440-38-2	Arsenic	23.5			F
7440-39-3	Barium	381			P
7440-41-7	Beryllium	1.0			P
7440-43-9	Cadmium	2.5			P
7440-70-2	Calcium	8810			P
7440-47-3	Chromium	15.0		*	P
7440-48-4	Cobalt	7.7	B		P
7440-50-8	Copper	165			P
7439-89-6	Iron	20200		*	P
7439-92-1	Lead	258			P
7439-95-4	Magnesium	4610			P
7439-96-5	Manganese	612			P
7439-97-6	Mercury	2.2			CV
7440-02-0	Nickel	10.4			P
7440-09-7	Potassium	3080			P
7782-49-2	Selenium	0.38	U	N	F
7440-22-4	Silver	1.3	B		P
7440-23-5	Sodium	210	B		P
7440-28-0	Thallium	0.21	B		F
7440-62-2	Vanadium	35.8		E*	P
7440-66-6	Zinc	539			P
	Cyanide				NR

4/2/92

Color Before: BROWN   Clarity Before: Texture: FINE

Color After: BROWN   Clarity After: Artifacts:

Comments:

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1 J

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHT757

Lab Name: WEYERHAEUSER COMPANY Contract: 68-D9-0080

Lab Code: WEYER Case No.: 17014 SAS No.: SDG No.: MHT750

Matrix (soil/water): SOIL Lab Sample ID: 76637

Level (low/med): LOW Date Received: 08/26/91

% Solids: 92.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	5080			P	
7440-36-0	Antimony	8.3	B	N	P	J
7440-38-2	Arsenic	17.2			F	
7440-39-3	Barium	364			P	
7440-41-7	Beryllium	0.45	B		P	
7440-43-9	Cadmium	1.8			P	
7440-70-2	Calcium	3560			P	
7440-47-3	Chromium	11.7		*	P	
7440-48-4	Cobalt	6.3	B		P	
7440-50-8	Copper	71.2			P	
7439-89-6	Iron	9950		*	P	
7439-92-1	Lead	1600			P	
7439-95-4	Magnesium	2560			P	
7439-96-5	Manganese	400			P	
7439-97-6	Mercury	0.12			CV	J
7440-02-0	Nickel	9.1			P	
7440-09-7	Potassium	941	B		P	
7782-49-2	Selenium	0.42	U	N	F	UJ
7440-22-4	Silver	1.2	B		P	
7440-23-5	Sodium	152	B		P	
7440-28-0	Thallium	0.21	U		F	
7440-62-2	Vanadium	15.5		E*	P	
7440-66-6	Zinc	412			P	
	Cyanide				NR	

4/21/9
46E

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: BROWN Clarity After: Artifacts:

Comments:

33-1

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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MHT758

Lab Name: WEYERHAEUSER COMPANY Contract: 68-D9-0080

Lab Code: WEYER Case No.: 17014 SAS No.: SDG No.: MHT750

Matrix (soil/water): SOIL Lab Sample ID: 76638

Level (low/med): LOW Date Received: 08/26/91

% Solids: 95.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	4060			P	
7440-36-0	Antimony	9.0	B	N	P	J
7440-38-2	Arsenic	447			F	
7440-39-3	Barium	193			P	
7440-41-7	Beryllium	0.28	B		P	
7440-43-9	Cadmium	0.91	B		P	
7440-70-2	Calcium	463	B		P	
7440-47-3	Chromium	5.8		*	P	
7440-48-4	Cobalt	0.81	B		P	
7440-50-8	Copper	432			P	
7439-89-6	Iron	14200		*	P	
7439-92-1	Lead	188			P	
7439-95-4	Magnesium	1100			P	
7439-96-5	Manganese	80.3			P	
7439-97-6	Mercury	0.40			CV	J
7440-02-0	Nickel	4.0	U		P	
7440-09-7	Potassium	1650			P	
7782-49-2	Selenium	0.82	B	N	F	J
7440-22-4	Silver	9.9			P	
7440-23-5	Sodium	259	B		P	
7440-28-0	Thallium	0.33	B		F	
7440-62-2	Vanadium	20.6		E*	P	
7440-66-6	Zinc	390			P	
	Cyanide				NR	

4/2/92
EG

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: BROWN Clarity After: Artifacts:

Comments:

35-2

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1K

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHT759

Lab Name: WEYERHAEUSER COMPANY   Contract: 68-D9-0080

Lab Code: WEYER   Case No.: 17014   SAS No.:   SDG No.: MHT750

Matrix (soil/water): SOIL   Lab Sample ID: 76639

Level (low/med): LOW   Date Received: 08/26/91

% Solids: 96.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3010			P
7440-36-0	Antimony	10.3	B	N	P
7440-38-2	Arsenic	295			F
7440-39-3	Barium	120			P
7440-41-7	Beryllium	0.27	B		P
7440-43-9	Cadmium	0.73	B		P
7440-70-2	Calcium	757	B		P
7440-47-3	Chromium	6.4		*	P
7440-48-4	Cobalt	0.97	B		P
7440-50-8	Copper	247			P
7439-89-6	Iron	16500		*	P
7439-92-1	Lead	275			P
7439-95-4	Magnesium	1100			P
7439-96-5	Manganese	103			P
7439-97-6	Mercury	0.51			CV
7440-02-0	Nickel	3.9	U		P
7440-09-7	Potassium	1620			P
7782-49-2	Selenium	0.65	B	N	F
7440-22-4	Silver	7.0			P
7440-23-5	Sodium	170	B		P
7440-28-0	Thallium	0.29	B		F
7440-62-2	Vanadium	20.6		E*	P
7440-66-6	Zinc	280			P
	Cyanide				NR

4/2/92
EGD

Color Before: BROWN   Clarity Before: Texture: FINE

Color After: BROWN   Clarity After: Artifacts:

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHT760

Lab Name: WEYERHAEUSER COMPANY   Contract: 68-D9-0080

Lab Code: WEYER   Case No.: 17014   SAS No.:   SDG No.: MHT750

Matrix (soil/water): SOIL   Lab Sample ID: 76640

Level (low/med): LOW   Date Received: 08/26/91

% Solids: 98.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	205			P
7440-36-0	Antimony	16.7		N	P
7440-38-2	Arsenic	412		S	F
7440-39-3	Barium	72.7			P
7440-41-7	Beryllium	0.19	U		P
7440-43-9	Cadmium	1.1			P
7440-70-2	Calcium	58.7	B		P
7440-47-3	Chromium	0.93	U	*	P
7440-48-4	Cobalt	0.56	U		P
7440-50-8	Copper	593			P
7439-89-6	Iron	4620		*	P
7439-92-1	Lead	197			P*
7439-95-4	Magnesium	25.3	B		P
7439-96-5	Manganese	6.5			P
7439-97-6	Mercury	0.62			CV
7440-02-0	Nickel	3.7	U		P
7440-09-7	Potassium	695	B		P
7782-49-2	Selenium	1.0		N	F
7440-22-4	Silver	19.7			P
7440-23-5	Sodium	79.3	B		P
7440-28-0	Thallium	0.33	B		F
7440-62-2	Vanadium	1.9	B	E*	P
7440-66-6	Zinc	386			P
	Cyanide				NR

4/2/92
ECD

Color Before: BROWN   Clarity Before: Texture: FINE

Color After: BROWN   Clarity After: Artifacts:

Comments:

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EPA SAMPLE NO.

1m

INORGANIC ANALYSIS DATA SHEET

MHT761

Lab Name: WEYERHAEUSER COMPANY   Contract: 68-D9-0080

Lab Code: WEYER   Case No.: 17014   SAS No.:   SDG No.: MHT750

Matrix (soil/water): SOIL   Lab Sample ID: 76641

Level (low/med): LOW   Date Received: 08/26/91

% Solids: 98.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	10400			P	
7440-36-0	Antimony	4.1	U	N	P	UJ
7440-38-2	Arsenic	11.2			F	
7440-39-3	Barium	123			P	
7440-41-7	Beryllium	0.90	B		P	
7440-43-9	Cadmium	1.0			P	
7440-70-2	Calcium	3460			P	
7440-47-3	Chromium	15.6		*	P	
7440-48-4	Cobalt	9.6			P	
7440-50-8	Copper	44.7			P	
7439-89-6	Iron	25900		*	P	
7439-92-1	Lead	108			P	
7439-95-4	Magnesium	4920			P	
7439-96-5	Manganese	1480			P	
7439-97-6	Mercury	0.04	U		CV	UJ
7440-02-0	Nickel	10.7			P	
7440-09-7	Potassium	2820			P	
7782-49-2	Selenium	0.37	U	N	F	UJ
7440-22-4	Silver	0.56	U		P	
7440-23-5	Sodium	97.7	B		P	
7440-28-0	Thallium	0.24	B		F	
7440-62-2	Vanadium	53.7		E*	P	
7440-66-6	Zinc	175			P	
	Cyanide				NR	

4/2/93
EGD

Color Before: BROWN   Clarity Before: Texture: FINE

Color After: BROWN   Clarity After: Artifacts:

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHT762

Lab Name: WEYERHAEUSER COMPANY Contract: 68-D9-0080

Lab Code: WEYER Case No.: 17014 SAS No.: SDG No.: MHT750

Matrix (soil/water): SOIL Lab Sample ID: 76642

Level (low/med): LOW Date Received: 08/26/91

% Solids: 87.3

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	10900			P	
7440-36-0	Antimony	6.6	B	N	P	J
7440-38-2	Arsenic	90.5			F	
7440-39-3	Barium	255			P	
7440-41-7	Beryllium	0.79	B		P	
7440-43-9	Cadmium	15.5			P	
7440-70-2	Calcium	2750			P	
7440-47-3	Chromium	13.0		*	P	
7440-48-4	Cobalt	4.9	B		P	
7440-50-8	Copper	415			P	
7439-89-6	Iron	19500		*	P	
7439-92-1	Lead	323			P*	
7439-95-4	Magnesium	2810			P	
7439-96-5	Manganese	934			P	
7439-97-6	Mercury	0.50			CV	J
7440-02-0	Nickel	7.5	B		P	
7440-09-7	Potassium	3250			P	
7782-49-2	Selenium	0.44	U	NW	F	UJ
7440-22-4	Silver	9.1			P	
7440-23-5	Sodium	215	B		P	
7440-28-0	Thallium	0.38	B		F	
7440-62-2	Vanadium	32.3		E*	P	
7440-66-6	Zinc	4310			P	
	Cyanide				NR	

4/2/93
EGE

Color Before: BROWN Clarity Before: Texture: FINE

Color After: BROWN Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHT763

Lab Name: WEYERHAEUSER COMPANY Contract: 68-D9-0080

Lab Code: WEYER Case No.: 17014 SAS No.: SDG No.: MHT750

Matrix (soil/water): SOIL Lab Sample ID: 76643

Level (low/med): LOW Date Received: 08/26/91

% Solids: 96.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	8630			P	
7440-36-0	Antimony	4.4	U	N	P	UJ
7440-38-2	Arsenic	42.9			F	
7440-39-3	Barium	228			P	
7440-41-7	Beryllium	0.62	B		P	
7440-43-9	Cadmium	3.3			P	
7440-70-2	Calcium	4320			P	
7440-47-3	Chromium	10.9		*	P	
7440-48-4	Cobalt	3.7	B		P	
7440-50-8	Copper	163			P	
7439-89-6	Iron	13900		*	P	
7439-92-1	Lead	154			P	
7439-95-4	Magnesium	2590			P	
7439-96-5	Manganese	576			P	
7439-97-6	Mercury	0.21			CV	J
7440-02-0	Nickel	5.9	B		P	
7440-09-7	Potassium	3330			P	
7782-49-2	Selenium	0.40	U	N	F	UJ
7440-22-4	Silver	2.2			P	
7440-23-5	Sodium	179	B		P	
7440-28-0	Thallium	0.24	B		F	
7440-62-2	Vanadium	20.0		E*	P	
7440-66-6	Zinc	828			P	
	Cyanide				NR	

4/2/93
EGD

Color Before: BROWN Clarity Before: Texture: FINE

Color After: BROWN Clarity After: Artifacts:

Comments:

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EPA SAMPLE NO.

1P

INORGANIC ANALYSIS DATA SHEET

MHT764

Lab Name: WEYERHAEUSER COMPANY Contract: 68-D9-0080

Lab Code: WEYER Case No.: 17014 SAS No.: SDG No.: MHT750

Matrix (soil/water): SOIL Lab Sample ID: 76644

Level (low/med): LOW Date Received: 08/26/91

% Solids: 83.4

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	7090			P	
7440-36-0	Antimony	93.7	B	N	P	J
7440-38-2	Arsenic	103			F	
7440-39-3	Barium	2020			P	
7440-41-7	Beryllium	2.3	U		P	
7440-43-9	Cadmium	56.9			P	
7440-70-2	Calcium	52700			P	
7440-47-3	Chromium	95.0		*	P	
7440-48-4	Cobalt	11.9	B		P	
7440-50-8	Copper	433			P	
7439-89-6	Iron	200000		*	P	
7439-92-1	Lead	2620			P	
7439-95-4	Magnesium	10100			P	
7439-96-5	Manganese	2040			P	
7439-97-6	Mercury	0.05	U		CV	UJ
7440-02-0	Nickel	77.7			P	
7440-09-7	Potassium	6980	B		P	
7782-49-2	Selenium	0.49	B	NW	F	J
7440-22-4	Silver	7.0	U		P	
7440-23-5	Sodium	1370	B		P	
7440-28-0	Thallium	0.21	U		F	
7440-62-2	Vanadium	30.4	B	E*	P	
7440-66-6	Zinc	77500			P	
	Cyanide				NR	

4/2/92
EGD

Color Before: BROWN Clarity Before: Texture: FINE

Color After: BLACK Clarity After: Artifacts:

Comments:

1-1

U.S. EPA - CLP

1Q

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHT765

Lab Name: WEYERHAEUSER COMPANY Contract: 68-D9-0080

Lab Code: WEYER Case No.: 17014 SAS No.: SDG No.: MHT750

Matrix (soil/water): SOIL Lab Sample ID: 76645

Level (low/med): LOW Date Received: 08/26/91

% Solids: 88.3

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	7860			P	
7440-36-0	Antimony	4.7	B	N	P	J
7440-38-2	Arsenic	24.1			F	
7440-39-3	Barium	213			P	
7440-41-7	Beryllium	0.64	B		P	
7440-43-9	Cadmium	3.4			P	
7440-70-2	Calcium	3410			P	
7440-47-3	Chromium	8.8		*	P	
7440-48-4	Cobalt	4.6	B		P	
7440-50-8	Copper	63.6			P	
7439-89-6	Iron	11100		*	P	
7439-92-1	Lead	1840			P	
7439-95-4	Magnesium	2340			P	
7439-96-5	Manganese	466			P	
7439-97-6	Mercury	0.13			CV	J
7440-02-0	Nickel	5.1	B		P	
7440-09-7	Potassium	2540			P	
7782-49-2	Selenium	0.44	U	N	F	UJ
7440-22-4	Silver	0.84	B		P	
7440-23-5	Sodium	175	B		P	
7440-28-0	Thallium	0.26	B		F	
7440-62-2	Vanadium	19.4		E*	P	
7440-66-6	Zinc	744			P	
	Cyanide				NR	

4/2/92
EGD

Color Before: BROWN Clarity Before: Texture: FINE

Color After: BROWN Clarity After: Artifacts:

Comments:

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EPA SAMPLE NO.

1Q

INORGANIC ANALYSIS DATA SHEET

MHT766

Lab Name: WEYERHAEUSER COMPANY Contract: 68-D9-0080

Lab Code: WEYER Case No.: 17014 SAS No.: SDG No.: MHT750

Matrix (soil/water): SOIL Lab Sample ID: 76646

Level (low/med): LOW Date Received: 08/26/91

% Solids: 94.3

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	7110			P	
7440-36-0	Antimony	4.6	B	N	P	J
7440-38-2	Arsenic	50.3			F	
7440-39-3	Barium	174			P	
7440-41-7	Beryllium	0.66	B		P	
7440-43-9	Cadmium	2.5			P	
7440-70-2	Calcium	6660			P	
7440-47-3	Chromium	7.9		*	P	
7440-48-4	Cobalt	4.1	B		P	
7440-50-8	Copper	83.7			P	
7439-89-6	Iron	11500		*	P	
7439-92-1	Lead	385			P	
7439-95-4	Magnesium	2290			P	
7439-96-5	Manganese	503			P	
7439-97-6	Mercury	0.14			CV	J
7440-02-0	Nickel	4.6	B		P	
7440-09-7	Potassium	2440			P	
7782-49-2	Selenium	0.38	U	N	F	UJ
7440-22-4	Silver	1.0	B		P	
7440-23-5	Sodium	169	B		P	
7440-28-0	Thallium	0.29	B		F	
7440-62-2	Vanadium	19.3		E*	P	
7440-66-6	Zinc	492			P	
	Cyanide				NR	

4/2/92
EGD

Color Before: BROWN Clarity Before: Texture: FINE

Color After: BROWN Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHT767

Lab Name: WEYERHAEUSER COMPANY   Contract: 68-D9-0080

Lab Code: WEYER   Case No.: 17014   SAS No.:   SDG No.: MHT750

Matrix (soil/water): SOIL   Lab Sample ID: 76647

Level (low/med): LOW   Date Received: 08/26/91

% Solids: 91.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	5210			P	
7440-36-0	Antimony	4.7	U	N	P	UJ
7440-38-2	Arsenic	22.8			F	
7440-39-3	Barium	137			P	
7440-41-7	Beryllium	0.45	B		P	
7440-43-9	Cadmium	1.0	B		P	
7440-70-2	Calcium	6100			P	
7440-47-3	Chromium	7.7		*	P	
7440-48-4	Cobalt	2.9	B		P	
7440-50-8	Copper	35.0			P	
7439-89-6	Iron	8220		*	P	
7439-92-1	Lead	160			P*	
7439-95-4	Magnesium	2200			P	
7439-96-5	Manganese	382			P	
7439-97-6	Mercury	0.05	U		CV	UJ
7440-02-0	Nickel	10.6			P	
7440-09-7	Potassium	2170			P	
7782-49-2	Selenium	0.43	U	N	F	UJ
7440-22-4	Silver	0.64	U		P	
7440-23-5	Sodium	159	B		P	
7440-28-0	Thallium	0.21	U		F	
7440-62-2	Vanadium	14.4		E*	P	
7440-66-6	Zinc	163			P	
	Cyanide				NR	

4/8/98
EGD

Color Before: BROWN   Clarity Before: Texture: FINE

Color After: BROWN   Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

1T

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHT768

Lab Name: WEYERHAEUSER COMPANY   Contract: 68-D9-0080

Lab Code: WEYER   Case No.: 17014   SAS No.:   SDG No.: MHT750

Matrix (soil/water): SOIL   Lab Sample ID: 76648

Level (low/med): LOW   Date Received: 08/26/91

% Solids: 71.4

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	6550			P	
7440-36-0	Antimony	5.4	U	N	P	UJ
7440-38-2	Arsenic	27.5			F	
7440-39-3	Barium	168			P	
7440-41-7	Beryllium	0.50	B		P	
7440-43-9	Cadmium	0.49	U		P	
7440-70-2	Calcium	2220			P	
7440-47-3	Chromium	9.4		*	P	
7440-48-4	Cobalt	3.2	B		P	
7440-50-8	Copper	57.1			P	
7439-89-6	Iron	10900		*	P	
7439-92-1	Lead	16.7			F*	
7439-95-4	Magnesium	2860			P	
7439-96-5	Manganese	140			P	
7439-97-6	Mercury	0.05	U		CV	UJ
7440-02-0	Nickel	6.2	B		P	
7440-09-7	Potassium	2130			P	
7782-49-2	Selenium	0.50	U	N	F	UJ
7440-22-4	Silver	0.73	U		P	
7440-23-5	Sodium	259	B		P	
7440-28-0	Thallium	0.25	U		F	
7440-62-2	Vanadium	21.0		E*	P	
7440-66-6	Zinc	236			P	
	Cyanide				NR	

4/2/92
EGD

Color Before: BROWN   Clarity Before: Texture: MEDIUM

Color After: BROWN   Clarity After: Artifacts:

Comments:

Sw-1

U.S. EPA - CLP

EPA SAMPLE NO.

1U

INORGANIC ANALYSIS DATA SHEET

MHT769

Lab Name: WEYERHAEUSER COMPANY Contract: 68-D9-0080

Lab Code: WEYER Case No.: 17014 SAS No.: SDG No.: MHT750

Matrix (soil/water): WATER Lab Sample ID: 76649

Level (low/med): LOW Date Received: 08/26/91

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	182	B		P	
7440-36-0	Antimony	22.0	U	N	P	UJ
7440-38-2	Arsenic	7.1	B		F	
7440-39-3	Barium	24.3	B		P	
7440-41-7	Beryllium	1.8	B		P	
7440-43-9	Cadmium	2.0	U		P	
7440-70-2	Calcium	15000			P	
7440-47-3	Chromium	5.6	B		P	
7440-48-4	Cobalt	3.0	U		P	
7440-50-8	Copper	27.5			P	
7439-89-6	Iron	292			P	
7439-92-1	Lead	46.0	U		P	
7439-95-4	Magnesium	3080	B		P	
7439-96-5	Manganese	29.9			P	
7439-97-6	Mercury	0.10	U		CV	UJ
7440-02-0	Nickel	20.0	U		P	
7440-09-7	Potassium	1290	B		P	
7782-49-2	Selenium	2.0	U		F	
7440-22-4	Silver	3.0	U		P	
7440-23-5	Sodium	8950		E	P	
7440-28-0	Thallium	1.0	U		F	
7440-62-2	Vanadium	3.0	U		P	
7440-66-6	Zinc	68.6			P	
	Cyanide				NR	

4/2/92
EGD

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

FORM I - IN

U.S. EPA - CLP

EPA SAMPLE NO.

1✓

INORGANIC ANALYSIS DATA SHEET

MHT769

Lab Name: WEYERHAEUSER COMPANY Contract: 68-D9-0080

Lab Code: WEYER Case No.: 17014 SAS No.: SDG No.: MHT750

Matrix (soil/water): WATER Lab Sample ID: 76649

Level (low/med): LOW Date Received: 08/26/91

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead	2.6	B		P
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury				NR
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

4/8/98
EGD

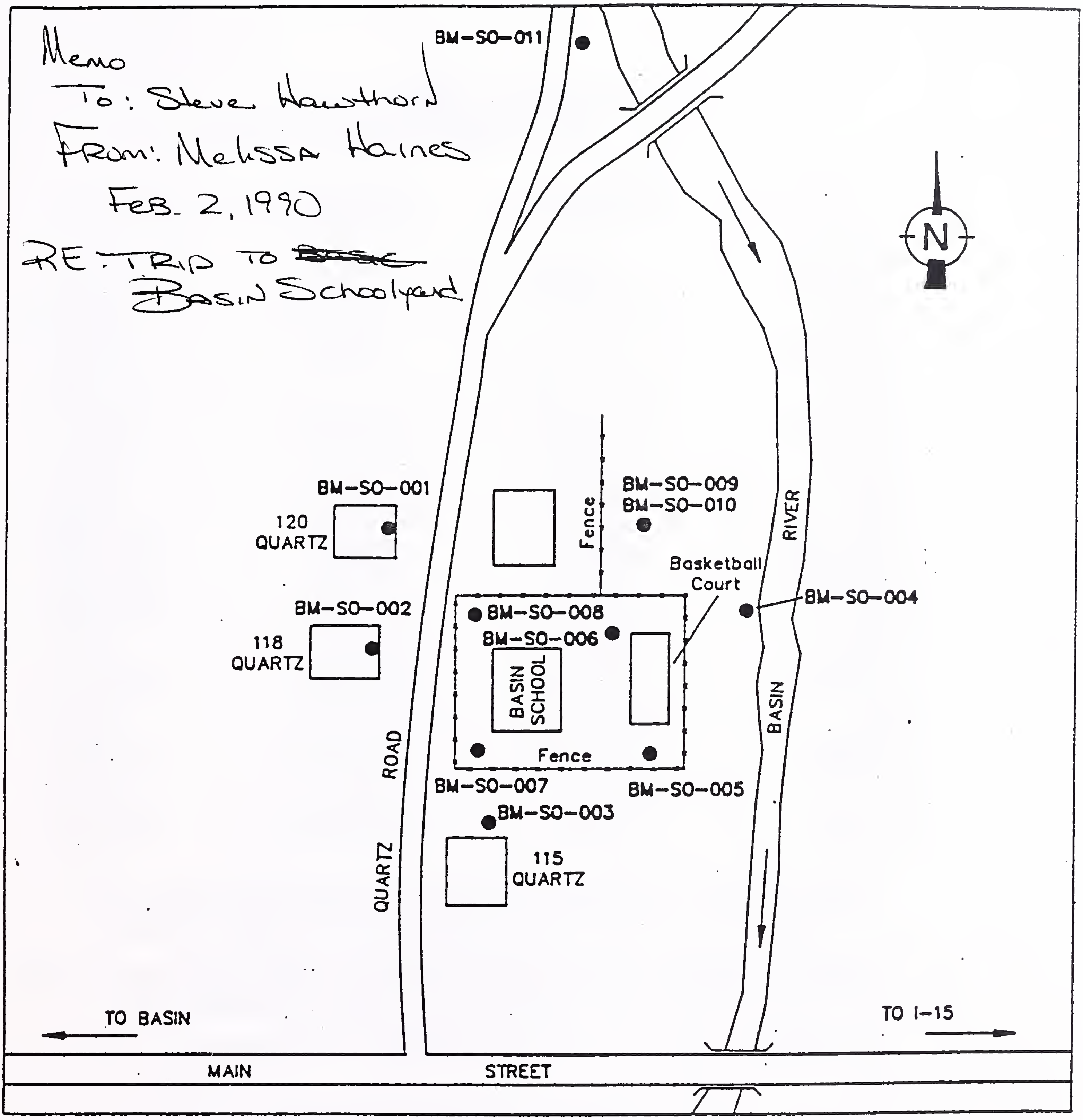
Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

FORM I - IN

Memo
To: Steve Hawthorn
From: Melissa Haines
Feb. 2, 1990
RE: Trip to ~~Basin~~
Basin Schoolyard



LEGEND

● Soil sample location

TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION
EPA CONTRACT 68-01-7368

TITLE:
BASIN SCHOOL YARD
Basin, Montana
SOIL SAMPLE LOCATION MAP

T.D.D. T08-8912-013

ecology & environment, inc.
DENVER, COLORADO

Fig. 1

Date: 02/90 Drawn by: RSM Scale: NTS

TABLE 2
SUMMARY OF SAMPLE ANALYSIS (mg/kg)
BASIN, MONTANA

	BM-SO-001 120 Quartz		BM-SO-002 118 Quartz		BM-SO-003 115 Quartz	
Aluminum	9860		9080.00		8600.00	
Antimony	9.10	U	10.20	BN	6.10	UN
Arsenic	19.7		50.50		24.50	
Barium	160.0		269.00		231.00	
Beryllium	.61	B	.54	B	.68	B
Cadmium	1.40	B	2.20		1.70	
Calcium	4920.00	E	5310.00	E	4030.00	E
Chromium	6.6	*	9.00	*	9.80	*
Cobalt	6.4	B	6.00	B	5.40	B
Copper	54.9	E	87.80	E	48.20	E
Iron	10800.00	E	10800.00	E	10400.00	E
Lead	156.00		161.00		1280.00	
Magnesium	2780.00		2430.00		2460.00	
Manganese	480.00		564.00	E	526.00	E
Mercury	.16	U	.11	U	.10	U
Nickel	10.80	B	6.60	B	5.70	B
Potassium	2620.00		2000.00		2680.00	
Selenium	.94	UW	.64	UW	.63	UW
Silver	1.30	U	.85	U	.84	U
Sodium	172.00	B	187.00	B	128.00	B
Thallium	.31	UW	.21	UW	.21	UW
Vanadium	17.10		17.00		16.30	
Zinc	249.00	EN	334.00	EN	306.00	EN
Cyanide	1.72		1.10	U	2.30	

U - The material was analyzed for but not detected. The associated numerical value is the estimated sample quantitation limit.

B - The reported value is less than the Contract Required Detection Limit (CRDL) but greater than the Instrument Detection Limit (IDL).

E - The reported value is estimated because of the presence of interference.

* - Duplicate analysis is not within control limits.

N - Spike sample recovery was not within control limits.

S - The reported value was determined by the Method of Standard Additions (MSA).

W - Post digestion spike for Furnace AA analysis is out of control limits (85-115%), while sample absorbance is less than 50% of the spike absorbance.

TABLE 2 (Cont.)
SUMMARY OF SAMPLE ANALYSIS (mg/kg)
BASIN, MONTANA

	BM-SO-004 Between School and Creek	BM-SO-005 SE - School Yard	BM-SO-006 NE - School Yard
Aluminum	3660.00	8520.00	7910.00
Antimony	14.20 UN	6.80 UN	7.60 UN
Arsenic	9.80	7.40	12.10
Barium	190.00	157.00	193.00
Beryllium	.49 U	.59 B	.80 B
Cadmium	1.50 U	.70 U	1.00 B
Calcium	40100.00 E	2900.00 E	4680.00 E
Chromium	3.40 U*	9.80 *	8.20 *
Cobalt	6.80 U	3.30 U	5.10 B
Copper	36.70 E	17.20 E	47.90 E
Iron	5690.00 E	7420.00 E	12100.00 E
Lead	50.10	23.20	110.00
Magnesium	6190.00	2180.00	2600.00
Manganese	341.00 E	260.00 E	646.00 E
Mercury	.24 U	.12 U	.13 U
Nickel	13.20 U	11.30	11.80
Potassium	2610.00	3100.00	2390.00
Selenium	1.50 UW	.70 UW	.78 UW
Silver	2.00 U	2.30 B	1.00 U
Sodium	216.00 B	115.00 B	136.00 B
Thallium	.49 UW	.23 UW	.26 UW
Vanadium	9.60 B	15.50	20.50
Zinc	198.00 EN	107.00 EN	279.00 EN
Cyanide	2.40 U	1.20 U	1.30 U

U - The material was analyzed for but not detected. The associated numerical value is the estimated sample quantitation limit.

B - The reported value is less than the Contract Required Detection Limit (CRDL) but greater than the Instrument Detection Limit (IDL).

E - The reported value is estimated because of the presence of interference.

* - Duplicate analysis is not within control limits.

N - Spike sample recovery was not within control limits.

S - The reported value was determined by the Method of Standard Additions (MSA).

W - Post digestion spike for Furnace AA analysis is out of control limits (85-115%), while sample absorbance is less than 50% of the spike absorbance.

TABLE 2 (Cont.)
SUMMARY OF SAMPLE ANALYSIS (mg/kg)
BASIN, MONTANA

	BM-SO-007 SW - School Yard	BM-SO-008 NW - School Yard	BM-SO-009 Field N of School
Aluminum	6250.00	6920.00	4650.00
Antimony	16.70 N	6.40 UN	7.50 UN
Arsenic	116.00	25.70 W	75.00 S
Barium	137.00	137.00	115.00
Beryllium	.65 B	.48 B	.54 B
Cadmium	.82 B	1.00 B	.78 U
Calcium	1710.00 E	2280.00 E	4340.00 E
Chromium	4.70 *	4.40 *	3.90 *
Cobalt	7.50 B	5.90 B	4.10 B
Copper	497.00 E	42.20 E	26.30 E
Iron	10300.00 E	9090.00 E	8950.00 E
Lead	172.00	80.90	74.40
Magnesium	1850.00	2720.00	2080.00
Manganese	414.00 E	446.00 E	289.00 E
Mercury	.11 U	.11 U	1.30 U
Nickel	5.70 U	7.20 B	7.00 U
Potassium	1500.00	1870.00	2560.00
Selenium	.64 U	.66 UW	.78 UW
Silver	1.10 B	.88 U	1.00 U
Sodium	121.00 B	102.00 B	86.30 B
Thallium	.21 UW	.22 UW	.26 UW
Vanadium	15.60	16.00	11.50 B
Zinc	245.00 EN	124.00 EN	118.00 EN
Cyanide	1.10 U	1.10 U	1.30 U

U - The material was analyzed for but not detected. The associated numerical value is the estimated sample quantitation limit.

B - The reported value is less than the Contract Required Detection Limit (CRDL) but greater than the Instrument Detection Limit (IDL).

E - The reported value is estimated because of the presence of interference.

* - Duplicate analysis is not within control limits.

N - Spike sample recovery was not within control limits.

S - The reported value was determined by the Method of Standard Additions (MSA).

W - Post digestion spike for Furnace AA analysis is out of control limits (85-115%), while sample absorbance is less than 50% of the spike absorbance.

TABLE 2 (Cont.)
SUMMARY OF SAMPLE ANALYSIS (mg/kg)
BASIN, MONTANA

	BM-SO-010 Dup of BM-SO-009	BM-SO-011 Background	BM-SO-012 Background
Aluminum	4780.00	6580.00	8430.00
Antimony	7.10 UN	7.20 UN	9.10 UN
Arsenic	82.50 S	75.70	81.10 S
Barium	92.20	74.30	117.00
Beryllium	.47 B	.33 B	.54 B
Cadmium	.73 U	.74 U	.85 B
Calcium	2840.00 E	3130.00 E	2230.00 E
Chromium	4.50 *	6.30 *	8.10 *
Cobalt	3.40 U	3.50 U	5.20 U
Copper	19.70 E	18.50 E	33.70 E
Iron	8390.00 E	10700.00 E	11000.00 E
Lead	57.20	25.60	59.20
Magnesium	2000.00	3020.00	2510.00
Manganese	242.00 E	457.00 E	341.00 E
Mercury	.12 U	.12 U	.10 U
Nickel	6.60 U	8.20 B	9.70
Potassium	2540.00	1770.00	2080.00
Selenium	7.30 UE	.74 UW	.62 UW
Silver	.98 U	.99 U	.83 U
Sodium	57.80 B	79.40 B	119.00 B
Thallium	.24 UW	.25 UW	.21 U
Vanadium	13.10	20.80	22.00
Zinc	95.40 EN	59.20 EN	131.00 EN
Cyanide	1.20 U	1.20 U	1.00 U

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S - The reported value was determined by the Method of Standard Additions (MSA).

W - Post digestion spike for Furnace AA analysis is out of control limits (85-115%), while sample absorbance is less than 50% of the spike absorbance.

TABLE 2 (Cont.)
SUMMARY OF SAMPLE ANALYSIS (mg/kg)
BASIN, MONTANA

	BF-SO-001 Stauner Property	
Aluminum	5130.00	
Antimony	6.20	UN
Arsenic	1.30	B
Barium	77.60	
Beryllium	.40	B
Cadmium	.64	U
Calcium	1170.00	
Chromium	1.80	B
Cobalt	3.00	U
Copper	8.30	
Iron	3760.00	
Lead	15.40	
Magnesium	1140.00	
Manganese	105.00	
Mercury	.11	U
Nickel	5.80	U
Potassium	1800.00	
Selenium	.64	U
Silver	.86	U
Sodium	208.00	B
Thallium	.21	UW
Vanadium	4.40	B
Zinc	20.10	
Cyanide	1.10	U

U - The material was analyzed for but not detected. The associated numerical value is the estimated sample quantitation limit.

B - The reported value is less than the Contract Required Detection Limit (CRDL) but greater than the Instrument Detection Limit (IDL).

E - The reported value is estimated because of the presence of interference.

* - Duplicate analysis is not within control limits.

N - Spike sample recovery was not within control limits.

S - The reported value was determined by the Method of Standard Additions (MSA).

W - Post digestion spike for Furnace AA analysis is out of control limits (85-115%), while sample absorbance is less than 50% of the spike absorbance.

Deerlodge National Forest
Basin Creek Drainage
Assay Results

Sample ID	Location	Description (Field Observation)	Au oz/ton	Ag oz/ton	Cu %	Pb %	Zn %
JJNA1	North Ada, Jefferson Co., Trench	Composite mixture of overburden and old mine dumps stirred together.	.008	.60	.230	.370	.070
JAJS1	North Ada, Jefferson Co., Dump	Vein material selected. Sulfide-rich (up to 40%) py-sph-gal-cor, qtz-sid	.076	8.58	.810	2.850	2.480
RJBU1	Bullion vein	Select	.268	15.80	.200	7.740	.900
RJBU2	Upper Bullion Mine, Jefferson Co., Tailings	Composite	.028	1.10	.023	.410	.037
RJBU3	Upper Bullion Mine, Jefferson Co., Tailings	Composite	.030	1.02	.035	.350	.029
RJBU4	Unknown Adit above upper Bullion Tailing	Composite of sulfide dump	.010	.08	.012	.047	.050
RJBD1	Un-Named adit main Bullion, NW Dump	Dump composite	.006	.24	.005	.006	.020
RJBD2	Un-Named adit main Bullion, SE Dump	Dump composite	.006	.02	.006	.007	.013
RJBD3	Un-Named adit main Bullion, SE Dump	Dump composite	.030	1.66	.190	.120	1.210
RJBC1	Bullion Creek Un-Named #1 Jefferson Co.	Composite of dump	.010	1.28	.066	1.080	.110
JJLB1	Lower Bullion Mill, Jefferson Co., Tailings	Composite of mostly unox tailings; qtz+ser? + unidentified dark minerals	.028	2.28	.021	.620	.047
JVJS1	Vindicator, Jefferson Co., Upper Trench	Comp. of"best"material from trench; alt Fe-stained wallrock&sparse chalcedony vein	.160	.26	.015	.048	.056
JVJS2	Vindicator, Jefferson Co., Caved Stope	Rep. thicks of, best part of zone, Chip channel, 3' of discontinuous vein(qtz-chal-py w/minor sph,gal,tet)&70	.048	7.80	.049	1.190	.500
JVJS3	Vindicator, Jefferson Co., North Dump	Dump composite, mainly Fe-stained wallrock w/some qtz-py(50%) vein	.060	.72	.022	.220	.070
JVJS4	Vindicator, Jefferson Co., Main Cut	Chip channel,5', several .5-1" channel vein w72' silicified zone & kaol, wallrock	.014	.02	.008	.011	.022
JVJS5	Vindicator, Jefferson Co., Main Cut	Chip channel, 5', 18" vein & wallrock w/ser-qtz-dissem py in sheer zone	.016	.48	.036	.350	.410
JVJS6	Vindicator, Jefferson Co., Main Dump	Composite of entire 'disturbed' dump	.012	.18	.026	.072	.084
JMJS1	Morning, Jefferson Co., Main Dump	Vein material; qtz-py (up to 50%) with some sph & gal	.120	19.10	.590	5.720	2.190
JMJS2	Morning, Jefferson Co., Main Dump	Composite of entire dump; Fe-stained ox wallrock & clays	.034	1.98	.075	.780	.068
JHJS1	Hawkeye, Jefferson Co., Upper Dump	Partly ox bk py-chal w/bk sooty sph(?). Select from dump	.032	1.76	.240	.140	.055
JHJS2	Hawkeye, Jefferson Co., Lower Dump	Select of vein from ore bin area. Qtz, chal, py, gal, sph, Fe-carb	.030	7.64	.570	1.330	.180
JJAE1	Adelaide, Jefferson Co., Main Dump	Composite of ox Fe-stained alt (kaol+ser-qtz) wallrock	.006	.02	.018	.320	.180
JJHE1	Hector, Jefferson Co., Main Vein	25' CC across vein area & altered wallrock	.008	.40	.025	.100	.180
JJHC1	Hector Mine, Jefferson Co., Dump	Composite of mineralized portions of dump. Kgm alt to kaol-py tr qtz-pyun	.006	.48	.170	.420	.550
JJBU1	Buckeye, Jefferson Co., Main Dump	Composite of main dump, kgm alt to ser-qtz-ab py	.090	3.02	.013	1.910	.110
JJBU2	Buckeye, Jefferson Co., Lower Tailings	Composite of ox & unox, stained tailings; mostly qtz	.098	1.12	.025	.390	.062
JJBU3	Buckeye, Jefferson Co., Upper Dump	Composite; mostly unox ser-qtz-py wallrock (kgm)	.036	.94	.024	.580	.078
JJLL1	Lady Leith, Jefferson Co., Main Dumps	Select of vein; Li-sulfide (py, ab gal)	.182	11.40	.420	3.100	.200
JJLL2	Double Shaft, Jefferson Co., Trenches	Samples oxidized Fe-stained siliceous breccia from 2 trenches	.006	.38	.000	.000	.000
JJGG1	Golden Glow, Jefferson Co., Dump	Select of vein from upper dump. Qtz, bk chal, tour, py, gal, aspy(?), teph.	.184	.28	.077	3.670	2.280
JJMS1	Morning Star, Jefferson Co., Dump	Select of silicified qtz-py breccia	.048	2.14	.021	.200	.034
JJSO1	Solar, Jefferson Co., Dump	Select sample of vein; hi sulfide (50%) w/ab py & 10% fet, ab tour, qtz	.058	3.32	.035	.510	.068
JJJE1	Jessie Mine, Jefferson Co., Dump	Select of vein material on dump	.040	2.30	.048	.270	.680
JJBB3	Basin Bell, Jefferson Co., Dump	Composite of main dump - some vein (qtz-50% py-sph), mostly kgm alt to kaol	.016	1.02	.320	.590	.120
JJAU1	Aurora Mine, Jefferson Co., Dump	Select of vein from dump. Hi sulfide - 50% py, 10% gal, sm sph	.274	5.06	.350	6.800	6.670
JJDW1	Daily West, Jefferson Co., Dump	Comp. of main sect. of dump-ox+unox vein(qtz-py)+kgm alt to qtz-ser-py+kaol-py	.014	.62	.072	1.760	.660

US FOREST SERVICE - DEERLODGE NATIONAL FOREST
BASIN CREEK DRAINAGE

Water Quality Results - Dissolved Concentrations

Mine/ Sample ID	Lab ID	Sample Site Location	pH (field)	Fe (mg/l)	Mn (mg/l)	Cl (mg/l)	SO4 (mg/l)	NO3 (mg/l)	F (mg/l)	Al (ug/l)	Ag* (ug/l)	As* (ug/l)	Ba* (ug/l)	Cd* (ug/l)	Cr* (ug/l)	Cu* (ug/l)	Hg* (ug/l)	Ni* (ug/l)	Pb* (ug/l)	Zn* (ug/l)
BULLION MINE																				
BBUS10M	92Q339	Unnamed #1, abv. conf. w/Jack Cr.	6.96	.046	.800	.2	45.8	-.10	.15	39.0	-.60	1.44	18.64	22.71	-.90	44.8	.07	5.43	.50	1968.0
BBUS20L	92Q338	Jack Cr. abv. conf. w/Unnamed #1	8.04	.033	-.002	.2	8.4	-.10	.13	27.0	-.60	4.83	10.10	-.60	-.90	3.6	.05	-2.40	.94	12.3
BBUS30M	92Q337	Jack Cr. downstream conf. w/ unnamed #1	7.47	.059	.182	.2	16.9	-.10	.17	49.0	-.60	2.56	15.64	3.98	-.90	21.7	.10	-2.40	-.40	373.3
BBUS40L	92Q109		7.09	.060	.002	.2	6.3	-.10	.11	62.6	-.60	2.22	19.87	-.60	-.90	4.9	.14	-2.40	1.21	31.7
BBUS50H	92Q308	Drainage from adit	2.58	129.0	23.2	-10.0	934.0	-.25	.64	17720.0	-.60	166.22	20.27	397.32	2.45	4698.0	.14	41.49	167.58	28230.0
BBUS60M	92Q316	Unnamed Cr. immed. below site	6.56	.231	1.0	.2	49.0	-.10	.12	86.0	-.60	1.30	14.05	20.55	-.90	71.9	.12	4.99	.53	2216.0
BBUS70M	92Q317	Mill site, downstream of caved adit	6.93	2.5	.533	.2	14.4	-.10	.39	59.0	-.60	2.34	41.37	-.60	-.90	-1.4	.12	-2.40	-.40	13.0
BBUS80L	92Q315	2nd Unnamed Cr., abv. site	6.87	.033	.004	.2	7.8	-.10	.10	83.0	-.60	1.23	34.95	-.60	-.90	2.5	.19	-2.40	-.40	17.0
BBUS90M	92Q318	Below caved adit, above mill site	7.36	.038	-.002	.2	7.8	-.10	.21	41.0	-.60	.92	31.24	-.60	-.90	-1.4	.15	-2.40	-.44	6.7
BBUSA0M	92Q340	Unnamed #2, downstream of smelter site	9.04	.031	.004	-.2	7.5	-.10	.20	31.0	-.60	1.35	37.49	-.60	-.90	-1.4	.15	-2.40	-.40	5.5
BBUSB0L	92Q341	Duplicate of Jack Cr. downstream(BBUS30M)	7.47	.054	.180	.2	17.1	-.10	.14	58.0	-.60	3.11	18.75	4.64	-.90	27.4	.07	1.42	-.40	442.8
BBUS10M-A	92Q421	Unnamed #1, abv. conf. w/Jack Cr.	6.96	.020	.860	-1.0	47.0	-.10	.07	28.0	-.60	.93	14.80	20.25	-.90	39.2	.05	5.20	-.40	1892.3
BBUS20L-A	92Q418	Jack Cr. abv. conf. w/Unnamed #1	7.63	.024	.002	-1.0	8.8	-.10	.06	45.0	.64	6.61	14.57	-.60	1.18	4.4	-.05	-2.40	.82	23.6
BBUS30M-A	92Q419	Jack Cr. downstream conf. w/ unnamed #1	7.48	.042	.168	-1.0	16.2	-.10	.06	34.0	-.60	2.83	18.74	3.83	-.90	22.8	-.05	-2.40	-.40	365.0
BBUS40L-A	92Q414	Above adit discharge	7.37	.022	.002	-1.0	6.5	-.10	.07	78.0	-.60	2.89	23.19	-.60	1.54	4.3	-.05	-2.40	1.40	28.3
BBUS60M-A	92Q413	Unnamed Cr. immed. below site	6.27	.751	1.1	-1.0	55.6	-.10	.12	38.0	-.60	1.72	25.57	74.49	-.90	141.2	-.05	7.64	1.05	2685.0
BBUS80L-A	92Q415	2nd Unnamed Cr. abv. site	7.58	.009	-.002	-1.0	7.8	-.10	.08	36.0	-.60	1.35	44.64	-.60	-.90	-1.4	-.05	-2.40	.72	6.0
BBUS90M-A	92Q420	Below caved adit, above mill site	7.60	.025	.002	-1.0	7.9	-.10	.06	19.0	-.60	1.11	35.92	-.60	-.90	-1.4	-.05	-2.40	-.40	11.5
BBUSA0M-A	92Q416	Unnamed #2, downstream of smelter site	7.58	.016	.002	-1.0	8.1	-.10	.06	39.7	-.60	1.58	42.33	-.60	-.90	-1.4	-.05	-2.40	-.40	8.7
BBUSB0L-A	92Q417	Duplicate of Jack Cr. downstream(BBUS30M-A)	7.48	.025	.173	-1.0	16.1	-.10	.08	50.0	-.60	3.18	22.14	4.45	-.90	24.9	-.05	-2.40	-.40	413.6
NO. EXCEEDED CWA-PRIMARY			-	-	-	-	-	0	0	-	-	1	0	5	0	-	0	0	1	-
NO. EXCEEDED CWA-SECONDARY			3	3	10	0	1	-	0	8	0	-	-	-	-	1	-	-	-	1
NO. EXCEEDED AQLC-ACUTE (1)			-	2	-	-	-	-	-	1	0	0	-	8/5	0	9/5	0	0	1/0	9/9
NO. EXCEEDED AQLC-CHRONIC (1)			-	-	-	-	-	-	-	1	0	0	-	9/9	0	9/9	13	0	1/1	9/9
NORTH ADA-PIERMONT																				
BNAS10H	92Q271	Downstream of shaft	3.14	15.5	3.1	-.1	164.0	-.05	.11	1880.0	.94	59.05	31.63	68.41	1.59	463.4	-.10	12.09	101.42	7596.0
BNAS20H	92Q276	Upstream of main dist. area (background)	6.56	.028	-.002	.2	3.2	-.05	.06	-50.0	-.60	1.43	8.25	-.60	-.90	-1.4	-.10	-2.40	.44	5.6
BNAS30H	92Q277	Below dump on Basin Creek side	3.70	4.2	.218	.2	43.2	-.05	.07	1130.0	-.60	15.40	8.41	6.08	1.00	93.7	-.10	2.71	4.32	700.5
BNAS40H	92Q278	Shaft, 10 ft. below water surface	3.92	1.300	.079	.2	25.8	-.05	.04	154.0	-.60	27.38	13.58	4.14	-.90	40.5	-.10	4.85	75.04	495.7
NO. EXCEEDED CWA-PRIMARY			-	-	-	-	-	0	0	-	-	1	0	2	0	-	0	0	2	-
NO. EXCEEDED CWA-SECONDARY			3	3	3	0	0	-	0	3	0	-	-	-	-	0	-	-	-	1
NO. EXCEEDED AQLC-ACUTE (1)			-	3	-	-	-	-	-	2	0	0	-	3/1	0	3/3	0	0	1/0	3/3
NO. EXCEEDED AQLC-CHRONIC (1)			-	-	-	-	-	-	-	3	1	0	-	3/3	0	3/3	+	0	3/2	3/3
MORNING MINE																				
BMOS10M	92Q275	Upper adit	6.31	.030	.008	.2	10.7	-.05	.05	-50.0	-.60	10.28	6.33	4.20	-.90	77.6	-.10	-2.40	-.40	384.9
BMOS20M	92Q274	Lower adit	6.31	.480	.480	.1	27.7	-.05	.05	-50.0	-.60	9.69	16.02	8.86	-.90	253.9	-.10	2.40	-.40	1277.0
NO. EXCEEDED CWA-PRIMARY			-	-	-	-	-	0	0	-	-	0	0	1	0	-	0	0	0	-
NO. EXCEEDED CWA-SECONDARY			2	1	1	0	0	-	0	0	0	-	-	-	-	0	-	-	-	0
NO. EXCEEDED AQLC-ACUTE (1)			-	0	-	-	-	-	-	0	0	0	-	2/1	0	2/2	0	0	0	2/2
NO. EXCEEDED AQLC-CHRONIC (1)			-	-	-	-	-	-	-	0	+	0	-	2/2	0	2/2	+	0	0	2/2

US FO T SERVICE - DEERLODGE NATIONAL FOREST
BASIN CREEK DRAINAGE

Water Quality Results - Dissolved Concentrations

Mine/ Sample ID	Lab ID	Sample Site Location	pH (field)	Fe (mg/l)	Mn (mg/l)	Cl (mg/l)	SO4 (mg/l)	NO3 (mg/l)	F (mg/l)	Al (ug/l)	Ag* (ug/l)	As* (ug/l)	Ba* (ug/l)	Cd* (ug/l)	Cr* (ug/l)	Cu* (ug/l)	Hg* (ug/l)	Ni* (ug/l)	Pb* (ug/l)	Zn* (ug/l)
VINDICATOR MINE																				
BVIS10M	92Q264	Adit discharge, sidehill	7.37	.072	.052	.2	13.9	.06	.14	61.5	-.60	1.88	2.81	4.69	-.90	44.3	-.10	-2.40	5.57	293.0
BVIS40M	92Q265	Flow from upper mine area to lower area	7.28	.019	-.002	.2	30.7	.06	.11	23.5	-.60	4.98	4.59	1.14	-.90	2.5	-.10	-2.40	-.40	162.3
BVIS50M	92Q266	Below falls, disch. below main workings	7.90	.384	.144	.2	20.9	-.05	.12	47.1	-.60	29.29	15.10	-.60	1.11	1.7	-.10	-1.31	1.45	23.8
BVIS60M	92Q267	Duplicate of BVIS50M	7.90	.344	.141	.2	21.1	-.05	.15	35.0	-.60	26.71	15.42	-.60	-.90	2.1	-.10	2.67	1.46	22.2
NO. EXCEEDED CWA-PRIMARY			-	-	-	-	-	0	0	-	-	0	0	0	0	-	0	0	0	-
NO. EXCEEDED CWA-SECONDARY			0	2	3	0	0	-	0	1	0	-	-	-	-	0	-	-	-	0
NO. EXCEEDED AQLC-ACUTE (1)			-	0	-	-	-	-	-	0	0	0	-	1/0	0	1/1	0	0	0	2/1
NO. EXCEEDED AQLC-CHRONIC (1)			-	-	-	-	-	-	-	0	+	0	-	2/1	0	1/1	+	0	1/0	2/1
HAWKEYE MINE																				
BHES10L	92Q307	Seepage above mine workings	6.87	.063	.012	.2	17.0	.46	.14	33.3	-.60	2.78	8.18	.78	-.90	-1.4	.10	-2.40	1.59	58.2
BHES20L	92Q299	Jack Cr. abv. mine site	7.80	.028	.004	.2	7.0	-.05	.05	36.8	-.60	2.73	8.40	.60	-.90	5.5	.14	-2.40	-.40	31.1
BHES30M	92Q298	Seepage at base of main dump	6.99	.247	3.7	5.0	21.9	.47	.09	34.0	-.60	11.09	36.92	-.60	3.53	-1.4	.12	6.43	.49	152.0
BHES40L	92Q300	Jack Cr. below site	7.85	.025	.007	.2	9.1	-.05	.05	-50.0	-.60	3.56	8.49	-.60	-.90	4.1	-.05	-2.40	.42	11.6
NO. EXCEEDED CWA-PRIMARY			-	-	-	-	-	0	0	-	-	0	0	0	0	-	0	0	0	-
NO. EXCEEDED CWA-SECONDARY			0	0	1	0	0	-	0	0	0	-	-	-	-	0	-	-	-	0
NO. EXCEEDED AQLC-ACUTE (1)			-	0	-	-	-	-	-	0	-	0	-	0	0	0	0	0	0	1/0
NO. EXCEEDED AQLC-CHRONIC (1)			-	-	-	-	-	-	-	0	+	0	-	0	0	0	3	0	0	1/0
BUCKEYE-ENTERPRISE																				
BBAS10H	92Q346	Adit discharge, eastern part of site	3.18	137.0	28.1	5.4	678.0	-.10	.46	12270.0	-.60	3438.05	22.24	119.50	2.79	609.0	-.05	19.40	1173.66	15020.0
BBAS20L	92Q345	Basin Cr. upstream of mine site	6.71	.071	.005	.2	1.5	-.10	.08	158.0	-.60	2.36	12.62	-.60	-.90	3.7	.18	-2.40	-.40	10.7
BBAS30H	92Q344	Conf sml seep-base of main wste rock dump	2.77	48.9	36.6	4.2	645.0	-.10	.49	40000.0	.72	235.31	10.31	156.82	2.36	1879.0	.18	15.41	128.37	15730.0
BBAS40L	92Q355	Basin Cr. @bridge bel. lrg.tailings wash	7.87	.164	.165	.4	8.1	.05	.08	183.0	-.60	20.16	12.59	1.54	-.90	12.9	.11	2.37	11.20	152.5
NO. EXCEEDED CWA-PRIMARY			-	-	-	-	-	0	0	-	-	2	0	2	0	-	0	0	2	-
NO. EXCEEDED CWA-SECONDARY			2	2	3	0	2	-	0	4	0	-	-	-	-	1	-	-	-	2
NO. EXCEEDED AQLC-ACUTE (1)			-	2	-	-	-	-	-	2	0	1	-	2/2	0	2/2	0	0	2/1	3/2
NO. EXCEEDED AQLC-CHRONIC (1)			-	-	-	-	-	-	-	4	0	2	-	3/2	0	3/3	3	0	3/3	3/2
LADY LEITH MINE																				
BLLS10L	92Q358	Unnamed Cr upstrm eastern portion site	6.82	.011	-.002	.3	4.9	.03	.06	-20.0	-.60	3.81	6.66	-.60	-.90	-1.4	-.05	-2.40	.54	5.7
BLLS20H	92Q362	Adit seepage, eastern portion site	3.35	2.0	1.3	-1.0	101.5	-.10	.14	2170.0	-.60	2.08	16.13	14.42	-.90	37.1	-.05	8.82	218.24	1282.0
BLLS30L	92Q359	Unnamed Cr dwnstrm E part & up W part	7.94	.013	.007	.4	6.2	.05	.04	38.2	-.60	5.10	9.65	-.60	-.90	-1.4	.06	-2.40	1.08	37.2
BLLS40H	92Q360	Adit seepage, W part of mine site	3.34	.122	.813	.2	41.5	-.05	.07	-20.0	-.60	10.80	8.35	-.60	-.90	-1.4	-.05	1.43	-.40	312.6
BLLS50L	92Q361	Unnamed Cr dwnstrm of mine site	7.69	.029	.021	-.5	6.9	-.05	.04	41.5	-.60	4.60	8.01	-.60	-.90	-1.4	-.05	-2.40	3.19	33.0
NO. EXCEEDED CWA-PRIMARY			-	-	-	-	0	0	0	1	0	0	0	1	0	-	0	0	1	-
NO. EXCEEDED CWA-SECONDARY			2	1	2	0	-	-	0	-	-	-	-	-	-	0	-	-	-	0
NO. EXCEEDED AQLC-ACUTE (1)			-	1	-	-	-	-	-	1	0	0	-	1/1	0	1/1	0	0	1/1	2/2
NO. EXCEEDED AQLC-CHRONIC (1)			-	0	-	-	-	-	-	1	0	0	-	1/1	0	1/1	+	0	1/1	2/2

US FOREST SERVICE - DEERLODGE NATIONAL FOREST
BASIN CREEK DRAINAGE

Water Quality Results - Dissolved Concentrations

Mine/ Sample ID	Lab ID	Sample Site Location	pH (field)	Fe (mg/l)	Mn (mg/l)	Cl (mg/l)	SO4 (mg/l)	NO3 (mg/l)	F (mg/l)	Al (ug/l)	Ag* (ug/l)	As* (ug/l)	Ba* (ug/l)	Cd* (ug/l)	Cr* (ug/l)	Cu* (ug/l)	Hg* (ug/l)	Ni* (ug/l)	Pb* (ug/l)	Zn* (ug/l)
WINTER CAMP																				
BWCS10L	92Q431	Joe Bowers Creek below adit discharge	7.34	.016	.003	-.1	9.7	-.10	.04	30.0	-.60	.97	16.19	-.60	-.90	2.1	-.05	-2.40	1.23	14.1
NO. EXCEEDED CWA-PRIMARY			-	-	-	-	-	0	0	-	-	0	0	0	0	-	0	0	0	-
NO. EXCEEDED CWA-SECONDARY			0	0	0	0	0	-	0	0	0	-	-	-	-	0	-	-	-	0
NO. EXCEEDED AQLC-ACUTE (1)			-	0	-	-	-	-	-	0	0	0	-	0	0	0	0	0	0	0
NO. EXCEEDED AQLC-CHRONIC (1)			-	-	-	-	-	-	-	0	0	0	-	0	0	0	+	0	0	0
HECTOR MINE																				
BHFS10L	92Q432	Unnamed Cr upstrm of mine site	8.43	.004	-.002	1.0	46.1	-.10	.17	-20.0	-.60	1.04	17.95	.61	-.90	-1.4	.09	-2.40	-.40	103.5
BHFS20L	92Q433	Unnamed Cr dwnstrm of two upstream adits	8.41	.009	.003	1.1	46.1	-.10	-.10	-20.0	-.60	1.11	23.18	.77	-.90	1.8	-.05	-2.40	.66	87.1
BHFS30L	92Q434	Unnamed Cr flow over waste rock dump	8.50	.009	.004	1.1	26.5	-.10	-.10	-20.0	-.60	.91	43.48	-.60	-.90	1.1	-.05	-2.40	-.40	8.1
BHFS40L	92Q435	Unnamed Cr dwnstrm where Cr branches join	7.81	.008	.028	1.1	44.8	-.10	-.10	-20.0	-.60	-.70	24.93	.94	-.90	1.9	-.05	-2.40	-.40	168.7
BHFS50L	92Q436	Southern end site, upstrm wste dump & adit	8.15	.006	.002	1.0	25.3	-.10	.24	21.0	-.60	1.18	59.90	-.60	-.90	.7	-.05	-2.40	-.40	8.1
BHFS60L	92Q437	Unnamed Cr ddwnstrm of wste dump & adit	8.21	.007	.002	1.1	26.2	-.10	.22	24.0	-.60	.80	53.23	-.60	-.90	.7	-.05	-2.40	-.40	29.2
BHFS70L	92Q438	Duplicate of BHFS60L	8.21	.004	-.002	1.1	26.1	-.10	.22	-20.0	-.60	.63	54.82	-.60	-.90	-1.4	-.05	-2.40	-.40	6.1
NO. EXCEEDED CWA-PRIMARY			-	-	-	-	-	0	0	-	-	0	0	0	0	-	0	0	0	-
NO. EXCEEDED CWA-SECONDARY			0	0	0	0	0	-	0	0	0	-	-	-	-	0	-	-	-	0
NO. EXCEEDED AQLC-ACUTE (1)			-	0	-	-	-	-	-	0	0	0	-	0	0	0	0	0	0	1/0
NO. EXCEEDED AQLC-CHRONIC (1)			-	-	-	-	-	-	-	0	0	0	-	0	0	0	1	0	0	1/0
BASIN CREEK																				
BBCS10L	92Q463	Jack Cr upstrm conf with Basin Cr	7.79	.067	.094	-1.0	17.0	-.10	.16	48.0	-.60	4.95	25.86	3.72	-.90	16.4	.07	-2.40	-.40	205.6
BBCS20L	92Q461	Basin Cr upstrm of conf with Jack Cr	7.81	.076	.004	3.5	6.2	-.10	.14	65.0	-.60	8.43	20.41	-.60	-.90	2.9	-.05	-2.40	1.00	17.1
BBCS30L	92Q462	Basin Cr below conf with Jack Cr	7.38	.073	.035	2.1	10.2	-.10	.12	55.0	-.60	6.58	22.58	1.33	-.90	8.9	.12	-2.40	.64	98.4
BBCS40L	92Q464	Basin Cr abv conf Spring Cr,abv Basin	7.82	.222	.021	1.2	8.9	-.10	.14	44.0	-.60	14.51	21.88	.84	-.90	7.8	-.05	-2.40	.92	54.7
NO. EXCEEDED CWA-PRIMARY			-	-	-	-	-	0	0	-	-	0	0	0	0	-	0	0	0	-
NO. EXCEEDED CWA-SECONDARY			0	0	0	0	0	-	0	2	0	-	-	-	-	0	-	-	-	0
NO. EXCEEDED AQLC-ACUTE (1)			-	0	-	-	-	-	-	0	0	0	-	0	0	0	0	0	0	1/0
NO. EXCEEDED AQLC-CHRONIC (1)			-	-	-	-	-	-	-	0	0	0	-	2/1	0	1/1	2	0	0	1/1

A minus (-) sign before a number means the concentration is less than the Method Detection Limit (MDL), for that analyte.
Value shown is the MDL, per SOW 200.8.

* Critical elements, lab data has been qualified according to QAPP.

(1) Where two values are listed, criteria is hardness dependent.
Values are calculated on hardness of 100 and 200 mg/l, respectively.

+ MDL is above Chronic Aquatic Life Criteria.

US FOREST SERVICE - DERRLODGE NATIONAL FOREST
BASIN CREEK DRAINAGE

Soil Analyses - Lab Qualified
(Concentrations mg/kg)

Mine/ Sample ID	Lab ID	Ag	C	Q	As	C	Q	Ba	C	Q	Cd	C	Q	Cr	C	Q	Cu	C	Q	Hg	C	Q	Ni	C	Q	Pb	C	Q	Zn	C	Q
VINDICATOR MINE																															
BVID10M	92S268	.89	B		25.87			24.76	B		1.47	B		4.04	B		38.00	B		.45			3.86	B		97.27			151.04		
BVID20M	92S269	.84	B		175.71			7.42	B		1.41	B		.00	U		26.71	B		.45			2.97	B		107.83			94.28		
NORTH ADA-PIERMONT																															
BNAD10H	92S280	3.40	B		1780.00			27.11	B		.31	B		2.78	B		56.59			.45			.00	U		1673.00			154.50		
BNAD10H	92S281	.00	U		.00	U		.00	U		.56	B		.00	U		.00	U		.19	B		.00	U		.00	U		14.94	B	
HAWKEYE MINE																															
BHED10M	92S304	.43	B		36.21			40.60	B		1.40	B		4.73	B		29.57	B		.26	B		7.87	B		42.08			134.53		
BHED20M	92S303	1.61	B		97.62			22.82	B		3.21	B		3.55	B		61.84			.50			6.07	B		123.22			309.57		
BULLION MINE																															
BBUD10H	92S311	30.92			7835.00			53.66	B		8.90	B		2.70	B		309.47			2.37			2.01	B		5356.00			1937.00		
BBUD20H	92S312	5.14	B		794.20			40.94	B		1.30	B		.00	U		49.19	B		.70			1.37	B		504.37			86.56		
BBUD30L	92S320	33.56		N	10979.29			85.00	B	N	8.13	B	N	4.07	B	N	398.73		N	1.71			1.23	B	N	2445.77			1055.62		
BBUD40L	92S321	.00	U	N	5.82	B		.00	U	N	.51	B	N	.00	U	N	.00	U	N	.21	B		.94	B	N	3.27	B		.00	U	
BBUD50L	92S322	.00	U	N	.00	U		.00	U	N	.58	B	N	.00	U	N	.00	U	N	.25	B		.00	U	N	.00	U		6.92	B	
BUCKEYE-ENTERPRISE																															
BBAD10H	92S347	58.66		N	4568.00			140.98	B	N	5.43	B	N	2.40	B	N	238.40		N	.68			.00	U	N	4029.00			117.00		
BBAD20H	92S356	28.17		N	7698.00			59.93	B	N	3.42	B	N	5.95	B	N	149.43		N	1.10			3.86	B	N	5841.00			259.75		
BBAD30H	92S357	22.22		N	9173.00			63.20	B	N	1.99	B	N	4.02	B	N	95.56		N	.83			2.82	B	N	3946.00			137.51		
LADY LEITH MINE																															
BLLD10H	92S364	3.02	B	N	264.71			47.78	B	N	1.49	B	N	4.42	B	N	20.78	B	N	.54			4.30	B	N	315.73			190.09		
BLLD20H	92S363	16.14	B	N	3146.00			29.73	B	N	4.27	B	N	1.33	B	N	76.68		N	.63			5.16	B	N	2404.00			729.80		
BLLD30H	92S365	.00	U	N	356.01			77.84	B	N	9.91	B	N	8.91	B	N	294.94		N	.65			4.01	B	N	166.31			628.49		
BASIN BELLE MINE																															
BBB10H	92S428	12.22	B	N	33.31			72.06	B	N	6.43	B	N	4.18	B	N	1429.32		N	.96	B		3.15	B	N	1825.01			1312.84		
HECTOR MINE																															
BHFW10H	92S429	.00	U	N	59.21			24.41	B	N	3.94	B	N	2.82	B	N	89.74		N	1.59			2.30	B	N	831.79			880.63		
BHFW20H	92S467	9.99	B	N	61.93			27.34	B	N	6.39	B	N	2.58	B	N	345.38		N	1.49			.52	U	N	483.98			1374.15		
BHFW30L	92S430	.00	U	N	.00	U		.00	U	N	.00	U	N	.48	U	N	.00	U	N	.40			.00	U	N	.00	U		1.59	U	
DAILY WEST MINE																															
BDWD10H	92S468	.00	U	N	44.13			47.70	B	N	1.08	B	N	2.74	B	N	89.83		N	1.02			.00	U	N	2325.81			251.17		
BDWW20H	92S469	4.11	B		65.52			28.00	B		.79	B		1.12	U	N	132.50		N	1.21			.00	U	N	2930.41			366.04		
BDWD20H	92S470	5.44	B		111.68			73.79	B		.45	B	N	1.87	B		140.75			.55			.00	U		7519.57			390.45		

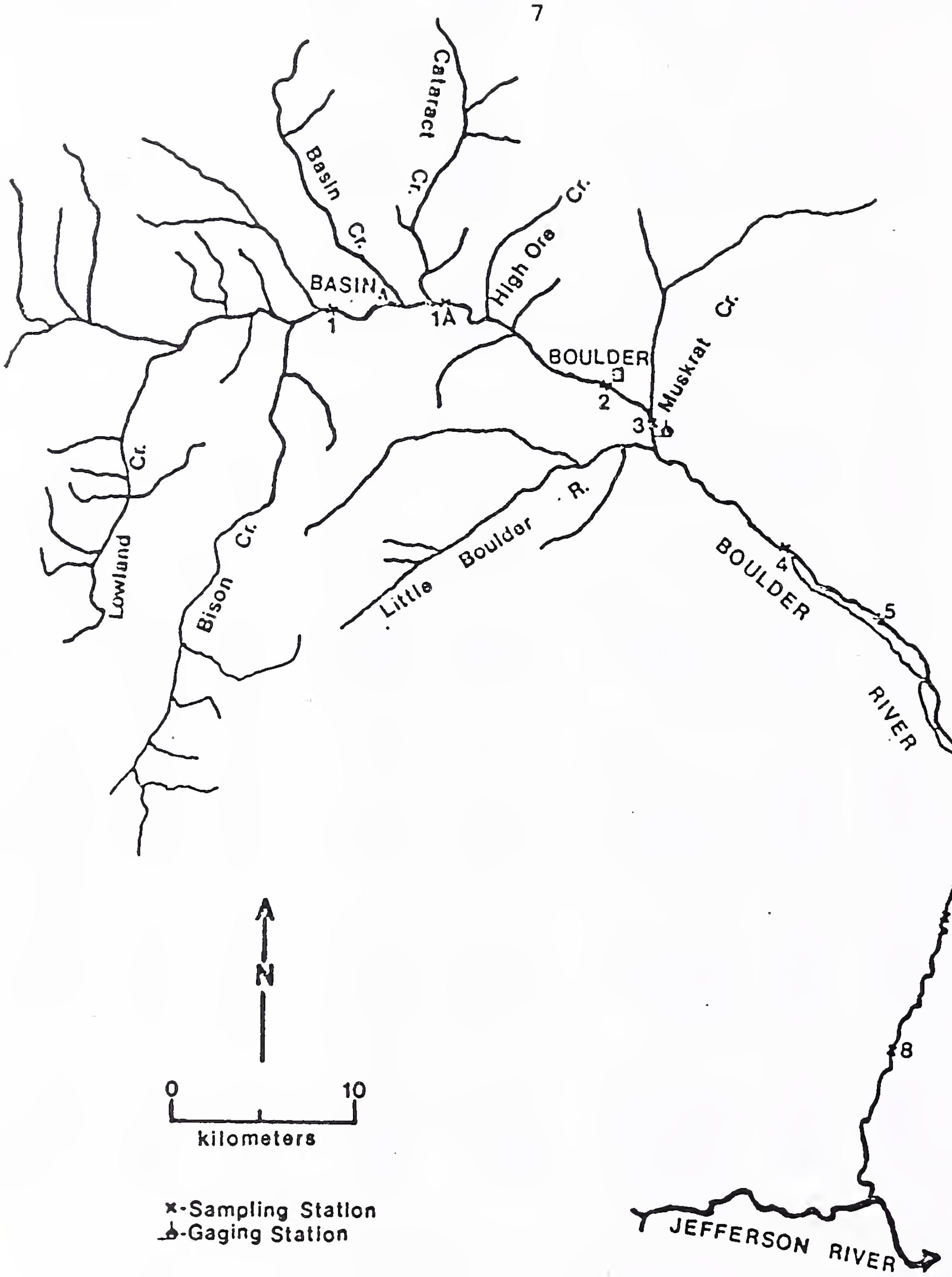


Figure 2. Map of the study area showing the location of sampling stations

These are all within
the range of lab error!

Table 18. Average Values and Ranges (in parentheses) of Heavy Metals Concentrations expressed as mg/ℓ Total Recoverable Metals from 14 Samples collected at Stations on the Boulder River during 1975 and 1976 (Analyses performed by Montana Public Health Service)

Metal	1	1-A	2	3	4	5	6	7	8
Zn	0.01 (<.01-0.05)	0.12 (0.06-0.25)	0.25 (0.07-0.80)	0.22 (0.11-0.40)	0.22 (0.14-0.49)	0.31 (0.14-0.75)	0.27 (0.07-1.00)	0.21 (0.05-0.72)	0.14 (0.02-0.43)
Fe	0.68 (0.22-1.80)	0.81 (0.18-2.00)	0.98 (0.21-2.60)	1.25 (0.28-4.20)	1.30 (0.30-4.80)	1.68 (0.30-5.20)	1.28 (0.27-2.50)	1.07 (0.30-2.80)	0.90 (0.15-2.20)
Cu	<.01 (<.01-0.02)	0.03 (<.01-0.09)	0.04 (<.01-0.10)	0.04 (<.01-0.13)	0.04 (<.01-0.15)	0.06 (<.01-0.24)	0.06 (<.01-0.34)	0.04 (<.01-0.22)	0.03 (<.01-0.07)
Pb	<.01 (<.01)	<.01 (<.01-0.05)	0.02 (<.01-0.09)	0.02 (<.01-0.12)	0.03 (<.01-0.10)	0.05 (<.01-0.19)	0.04 (<.01-0.24)	0.02 (<.01-0.12)	0.02 (<.01-0.07)

Table 20. Concentrations of Zinc expressed as mg/ℓ Total Recoverable Metals in Water Samples from Established Stations and Selected Tributaries on the Upper Boulder River

Date	St. 1 (above Basin Crk)	Basin Creek	Cataract Creek	St. 1-A (below Cataract)	High Ore Creek	St. 2 (below High Ore)
4/26/75	<.01	0.20	0.54	0.14	3.90	0.44
5/11/	<.01	0.31	0.66	0.20	5.70	0.30
6/10/	<.01	0.11	0.25	0.09	4.20	0.16
5/13/76	0.01	0.09	0.19	0.06	3.25	0.09
6/16/	<.01	0.14	0.22	0.08	1.50	0.11
7/12/	<.01	0.10	0.30	0.08	2.10	0.14
8/ 6/	<.01	0.11	0.40	0.08	2.25	0.15
9/ 2/	<.01	0.14	0.45	0.11	4.70	0.20
10/ 6/	<.01	0.15	0.51	0.11	3.50	0.24

Table 21. Average Values and Ranges (in parentheses) of 19 Samples of Zinc Concentrations expressed as mg/ℓ Total Recoverable Metals from Stations on the Boulder River from April 1975 to October 1976

Year	Station								
	1	1-A	2	3	4	5	6	7	8
1975	0.01 (<.01-0.05)	0.14 (0.09-0.20)	0.35 (0.11-0.80)	0.27 (0.13-0.40)	0.27 (0.14-0.49)	0.39 (0.18-0.73)	0.31 (0.14-0.46)	0.24 (0.10-0.41)	0.17 (0.03-0.28)
1976	0.01 (<.01-0.05)	0.12 (0.06-0.25)	0.17 (0.09-0.30)	0.18 (0.11-0.24)	0.18 (0.09-0.34)	0.27 (0.14-0.75)	0.26 (0.07-1.00)	0.21 (0.05-0.72)	0.13 (0.02-0.43)

CHEMISTRY LABORATORY BUREAU
DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES

TO: Solid and Hazardous Waste Bureau

ATTENTION: Carol Fox

SUBJECT: Analytical results for Basin Schoolyard, metals

Laboratory #:	Sample # or ID:	Sample Description:
SW 4255	BS-05-12"	soil
SW 4256	BS-12-06"	soil

SAMPLE HANDLING INFORMATION:

SAMPLES SUBMITTED BY:	Carol Fox
DATE SAMPLES COLLECTED:	06/11/90
DATE RECEIVED IN LABORATORY:	06/29/90
DATE REPORTED BY LABORATORY:	07/31/90
RESPONSIBILITY CODE:	# 2231

LABORATORY #: all results in micrograms per gram

	4255	4255 dup	4256
As	57.1	57.1	14.8

METHOD:

Microwave digestion of soils; EPA 200.7 for analysis

QUALITY ASSURANCE:

NBS 1645, reference soil, analyzed with a recovery of 110%

REPORT SUBMITTED BY:

Judy Halm

Judy Halm
Chemist
CHEMISTRY LABORATORY BUREAU

CHEMISTRY LABORATORY BUREAU
DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES

REPORT TO: Solid and Hazardous Waste Bureau

ATTENTION: Carol Fox

SUBJECT: Analytical results for As in Basin School Yard Soil

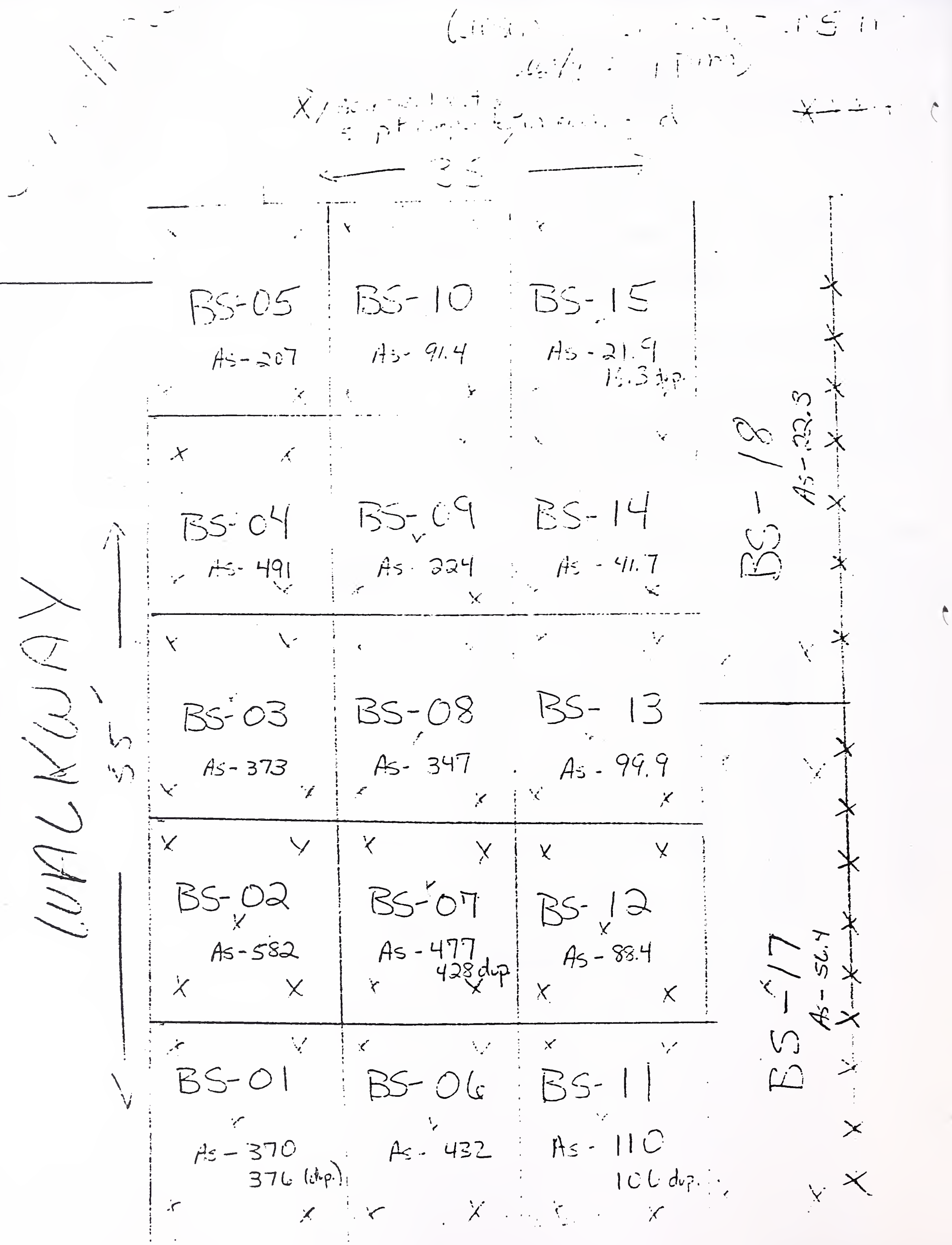
Laboratory #:	Sample # or ID:	Sample Description:
SW 4237 - 4250	BS-01 to BS15	soil at varying depths
SW 4251	BS-RI	water

SAMPLE HANDLING INFORMATION:

SAMPLES SUBMITTED BY:	Carol Fox
DATE SAMPLES COLLECTED:	06/11/90
DATE RECEIVED IN LABORATORY:	06/11/90
DATE REPORTED BY LABORATORY:	06/29/90
RESPONSIBILITY CODE:	# 2231

LABORATORY #: all results in micrograms per gram

Lab #:	SHWB ID:	As
SW 4237	BS-01 6"	199. ug/g
4237 dup		203.
SW 4238	BS-01 12"	158.
SW 4239	BS-01 18"	105.
SW 4240	BS-03 6"	128.
SW 4241	BS-03 12"	139.
SW 4242	BS-03 18"	121.
SW 4243	BS-05 6"	75.2
SW 4244	BS-07 6"	13.1
SW 4245	BS-09 6"	17.0
SW 4246	BS-09 12"	11.8.
SW 4247	BS-09 12" dup	11.8
SW 4248	BS-11 6"	40.7
SW 4249	BS-13 6"	34.6
SW 4250	BS-15 6"	17.2
SW 4251	BS-RI water rinse	<.001 mg/L


35
35
WALKWAY
BS-05
As-207
BS-10
As-91.4
BS-15
As-21.9
15.3 dup.
BS-04
As-491
BS-09
As-224
BS-14
As-41.7
BS-18
As-22.3
BS-03
As-373
BS-08
As-347
BS-13
As-99.9
BS-02
As-582
BS-07
As-477
428 dup
BS-12
As-88.4
BS-17
As-56.4
BS-01
As-370
376 (dup.)
BS-06
As-432
BS-11
As-110
106 dup.

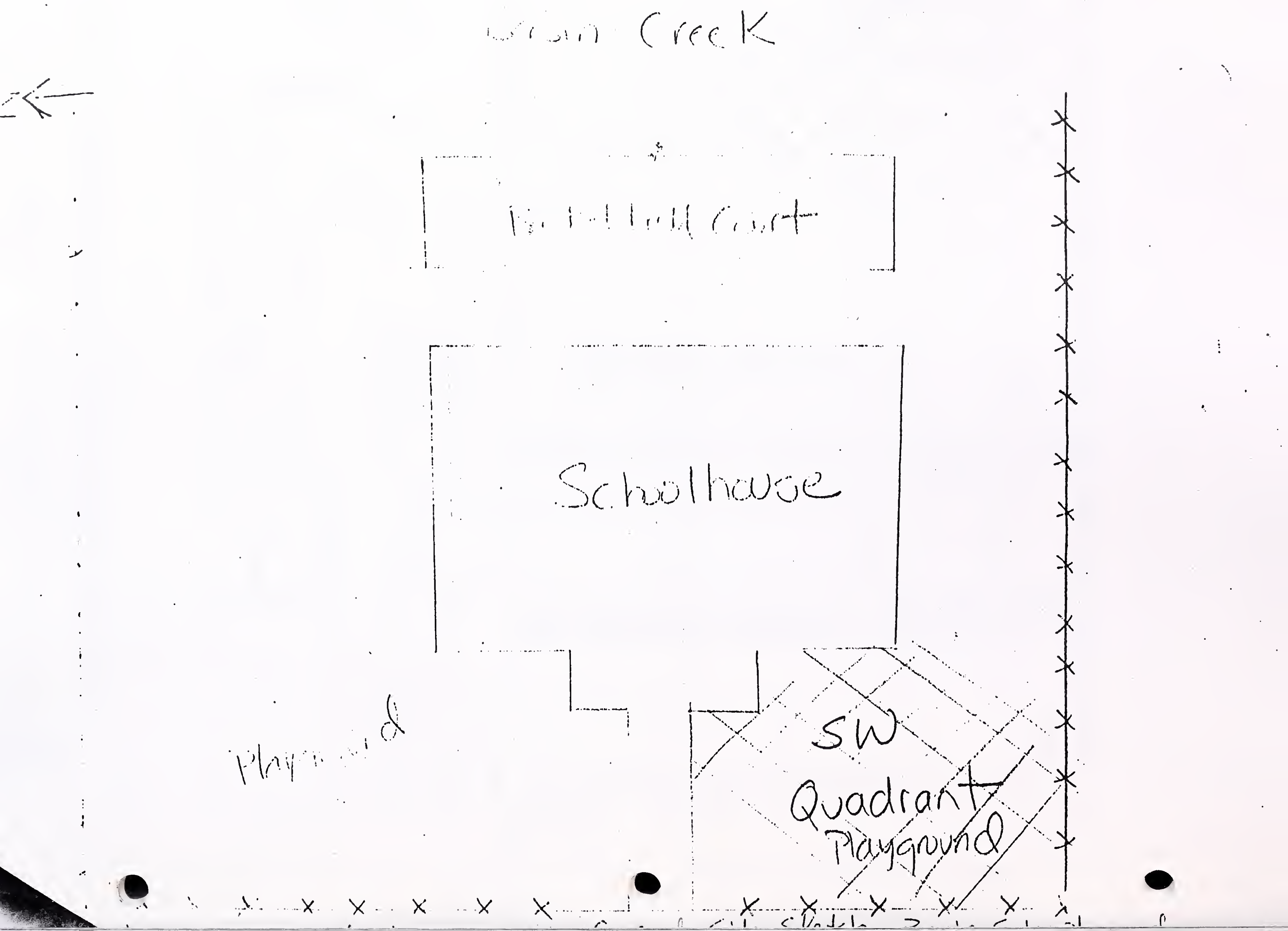
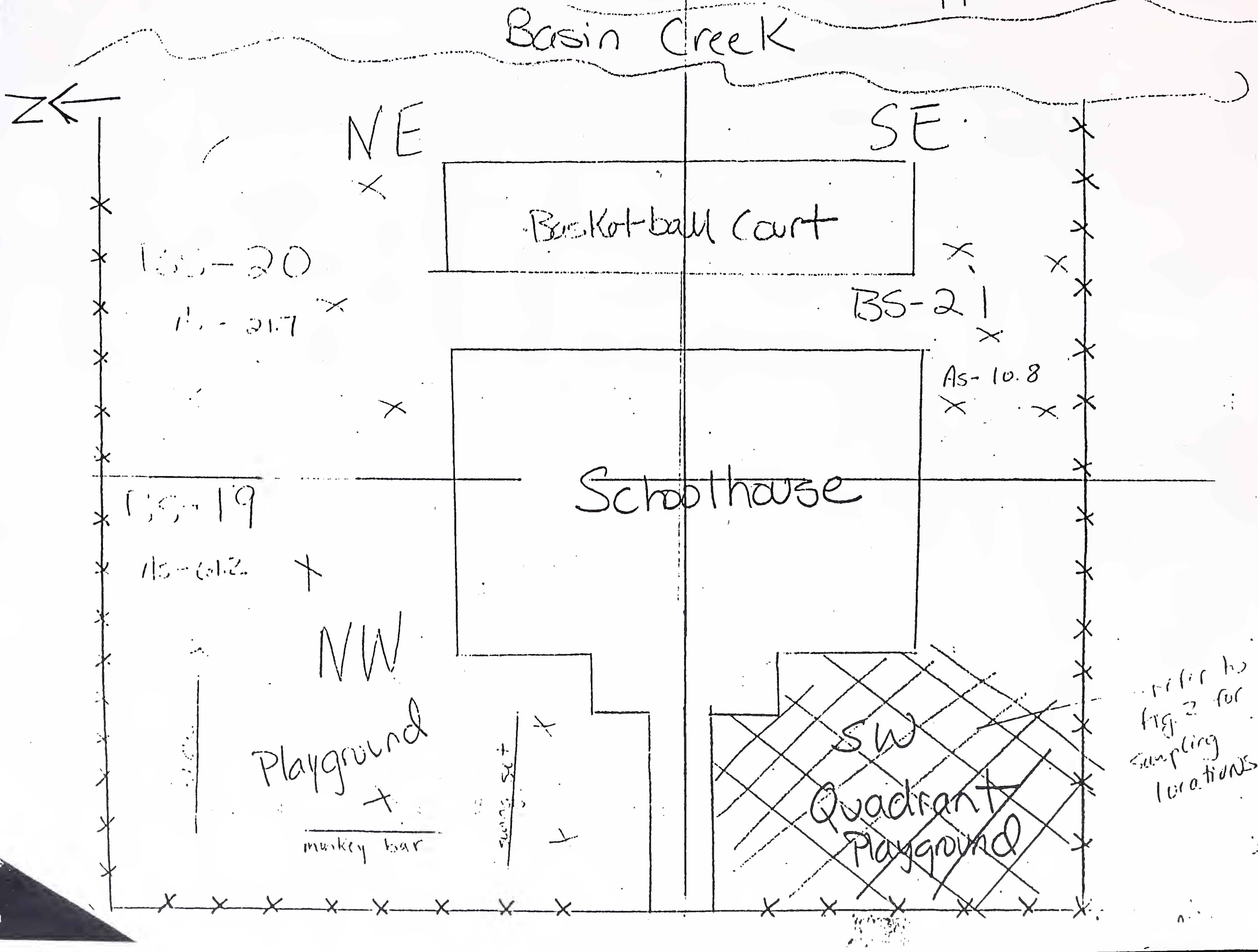

Creek
Basketball Court
Schoolhouse
Playground
SW Quadrant Playground

Fig 3/ Other sampling locations, NW, NE, and SE quadrant
As concentrations in ppm



refer to fig. 2 for sampling locations.

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ATTACHMENT I. BASIN SOIL SAMPLING RESULTS - APRIL 1990

CHEMISTRY LABORATORY BUREAU
DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES

REPORT TO: Solid and Hazardous Waste Bureau

ATTENTION: Carol Fox

SUBJECT: Analytical results for Basin schoolyard metals

Laboratory #:	Sample # or ID:	Sample Description:
SW 4174-4196	BS-1 through BS-22	soil, water

SAMPLE HANDLING INFORMATION:

SAMPLES SUBMITTED BY:	Carol Fox
DATE SAMPLES COLLECTED:	04/18/90
DATE RECEIVED IN LABORATORY:	04/18/90
DATE REPORTED BY LABORATORY:	04/30/90
RESPONSIBILITY CODE:	# 2231

LABORATORY #: all results in micrograms per gram

LABORATORY #:	ID	As
4174	BS-1	370.
4174 DUP	BS-1	376.
4175	BS-2	582.
4176	BS-3	373.
4177	BS-4	491.
4178	BS-5	207.
4179	BS-6	432.
4180	BS-7	477.
4181	BS-8	347.
4182	BS-9	224.
4183	BS-10	91.4
4184	BS-11	110.
4184 DUP	BS-11	106.
4185	BS-12	88.4
4186	BS-13	99.9
4187	BS-14	41.7
4188	BS-15	21.9
4189	BS-16	16.3 (duplicate of BS-15)
4190	BS-17	56.4
4191	BS-18	22.3
4192	BS-19	61.2
4193	BS-20	21.7
4194	BS-21	10.8
4195	BS-22(WATER)	<.001 mg/L
4195 dup	BS-22	<.001 mg/L
4195 Spike	BS-22	105%
4196	BS-07 DUP	428.
NBS 1645		69.6 105% RECOVERY

INORGANIC ANALYSIS DATA SHEET

MHL934

Lab Name: DATACHEM INC Contract: 68-W8-0015

Lab Code: DATAC[illegible] Case No.: 12329 SAS No.: SDG No.: MHL93

Matrix (soil/water): SOIL Lab Sample ID: GLP318

Level (low/med): LOW Date Received: 07/17/8

% Solids: 70.4

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	7640			P	
7440-36-0	Antimony	10.1	U		P	
7440-38-2	Arsenic	6.1			F	
7440-39-3	Barium	236			P	
7440-41-7	Beryllium	0.57	U		P	
7440-43-9	Cadmium	0.94	U		P	
7440-70-2	Calcium	2750			P	
7440-47-3	Chromium	9.7		B	P	LAF
7440-48-4	Cobalt	[6.2]	~~B~~		P	LAF
7440-50-8	Copper	14.9			P	
7439-89-6	Iron	9790			P	
7439-92-1	Lead	8.6		B	F	LAF
7439-95-4	Magnesium	2920			P	
7439-96-5	Manganese	304			P	
7439-97-6	Mercury	0.14	U		CV	
7440-02-0	Nickel	[8.5]	~~B~~		P	LAF
7440-09-7	Potassium	2180			P	
7782-49-2	Selenium	0.43	U		F	
7440-22-4	Silver	1.6	U		P	
7440-23-5	Sodium	[364]	~~B~~		P	LAF
7440-28-0	Thallium	[1.2]	~~B~~	~~W~~ UJ	F	LAF
7440-62-2	Vanadium	20.5			P	
7440-66-6	Zinc	45.8			P	
	Cyanide	1.4	U		AS	

Color Before: BROWN Clarity Before: Texture: COURSE

Color After: YELLOW Clarity After: Artifacts:

Comments:

TABLE 1
GROUND WATER DATA - INORGANIC ANALYSIS
BASIN MINING SITE
BASIN, MONTANA
TDD F08-8910-07 - PAN FMT0069SBA
CASE # 12329
(µg/l or ppb)

SAMPLE ID # TRAFFIC RPT # LOCATION	BM-GW-2 MHL-940 ULSHER'S WELL	BM-GW-3 MHL-941 BASIN SUPPLY WELL	BM-GW-4 MHL-942 DUP OF GW-3	BM-GW-5 MHL-943 MARTIN'S WELL	BM-GW-6 MHL-944 TRIP BLANK
Aluminum	129u	129u	129u	129u	129u
Antimony	115uj	[36.7]ub	35.4u	35.4u	35.4u
Arsenic 050	[2.4]	[2.4]	[3.4]	2.2u	2.2u
Barium 1000	[31.9]	25.4u	[25.5]	[41.1]	25.4u
Beryllium	2.0u	2.0u	2.0u	2.0u	2.0u
Cadmium 10	[4.1]ubj	3.3u	3.3u	3.3u	3.3u
Calcium	422000	18100	16800	37100	215u
Chromium 50	5.4u	[8.8]ub	5.4u	[5.5]ub	5.4u
Cobalt	11.6u	11.6u	11.6u	11.6u	11.6u
Copper	91.1b	[7.6]ub	[14.8]ub	37.1b	4.0u
Iron	118	261	[87.0]	153	[24.3]
Lead 50	0.90u	0.90u	0.90u	[1.1]	0.90u
Magnesium	11100	5510	5180	9700	165u
Manganese	3.4u	3.4u	[3.9]ub	3.4u	165u
Mercury 2.	0.20u	0.20u	0.20u	0.20u	0.20u
Nickel	20.5u	[22.8]j	20.5u	20.5u	20.5u
Potassium	[1200]ub	[1670]	[1870]ub	[2890]ub	537u
Selenium 10	1.5u	1.5u	1.5u	1.5u	1.5u
Silver 50	5.6u	5.6u	5.6u	5.6u	5.6u
Sodium	14000	[4950]	[5000]	12100	1270u
Thallium	1.8u	1.8	1.8	1.8u	1.8u
Vanadium	11.3u	11.3u	11.3u	11.3u	11.3u
Zinc	32.2	29.5	33.8	299	73.5
Cyanide	10.0u	10.0u	10.0u	10.0u	10.0u

b - Material was detected in the laboratory blanks. Quantity reported is >5X the amount found in the blank (>10X for methylene chloride, acetone, toluene, and phthalates). A false positive result may exist.

j - The associated numerical value is an estimated quantity because the amount detected is below the contract required detection limit (CRDL) or because minor quality control criteria were not met. Presence of the material is reliable.

u - The material was analyzed for, but was not detected. The associated numerical value is the estimated sample quantitation limit or CRDL.
[] - The associated numerical value is an estimated quantity because the amount detected is below the contract required detection limit (CRDL). Presence of the material is reliable. (Inorganic data only).

TABLE 2
SURFACE WATER DATA - INORGANIC ANALYSIS
BASIN MINING SITE
BASIN, MONTANA
TDD F08-8910-07 - PAN FMT0069SBA
CASE # 12329
(µg/l or ppb)

SAMPLE ID #	BM-SW-1	BM-SW-2	BM-SW-3	BM-SW-4
TRAFFIC RPT #	MHL-924	MHL-929	MHL-930	MHL-931
LOCATION	BCKGRND BOULDER RIVER	DNSTRM JIB MILL	BCKGRND BASIN CREEK	CONFLNCE BASIN C/ BOULDER R
Aluminum	129u	[136]	136	129u
Antimony	35.4u	[52.4]	62.5uj	[39.1]ub
Arsenic	[5.4]	10.0	[9.7]	10.0
Barium	25.4u	25.4u	[133]	25.4u
Beryllium	2.0u	2.0u	2.0u	2.0u
Cadmium	3.3u	3.3u	3.3u	3.3u
Calcium	14300	34000	8270	8440
Chromium	13.8uj	[5.9]	[8.8]ub	5.4u
Cobalt	11.6u	11.6u	11.6u	11.6u
Copper	4.0u	[15.2]	4.0u	[11.4]ub
Iron	390	350	148	178
Lead	[1.0]	5.0	3.8	[1.0]
Magnesium	[2770]	5980	[1950]	[2040]
Manganese	15.4uj	36.3	[3.6]ub	[8.3]ub
Mercury	0.20u	0.20u	0.20u	0.20u
Nickel	20.5u	20.5u	20.5u	20.5u
Potassium	[2310]ub	[2050]	[1310]ub	537u
Selenium	1.5u	1.5u	1.5u	1.5u
Silver	5.6u	5.6u	5.6u	5.6u
Sodium	8610	12800	[3320]	[3220]
Thallium	1.8u	1.8u	1.8u	1.8u
Vanadium	11.3u	11.3u	11.3u	11.3u
Zinc	20.8	65.0	50.3	44.3
Cyanide	10.0u	10.0u	10.0u	10.0u

b - Material was detected in the laboratory blanks. Quantity reported is >5X the amount found in the blank (>10X for methylene chloride, acetone, toluene, and phthalates). A false positive result may exist.

j - The associated numerical value is an estimated quantity because the amount detected is below the contract required detection limit (CRDL) or because minor quality control criteria were not met. Presence of the material is reliable.

u - The material was analyzed for, but was not detected. The associated numerical value is the estimated sample quantitation limit or CRDL.
[] - The associated numerical value is an estimated quantity because the amount detected is below the contract required detection limit (CRDL). Presence of the material is reliable. (Inorganic data only).

TABLE 2 CONT.
SURFACE WATER DATA - INORGANIC ANALYSIS
BASIN MINING SITE
BASIN, MONTANA
TDD F08-8910-07 - PAN FMT0069SBA
CASE # 12329
(µg/l or ppb)

SAMPLE ID #	BM-SW-5	BM-SW-6	BM-SW-7
TRAFFIC RPT #	MHL-932	MHL-933	MHL-953
LOCATION	DNSTRM ATWATER COMPLEX	TRIP BLANK	PONDED WATER BEHIND SMELTER STACK
Aluminum	129u	129u	5200
Antimony	[52.1]ub	[48.2]ub	35.4u
Arsenic	[8.0]	2.2u	[3.1]
Barium	25.4u	25.4u	[31.3]
Beryllium	2.0u	2.0u	[2.8]ub
Cadmium	5.4uj	3.3u	237j
Calcium	13200	215u	170000
Chromium	[6.8]ub	5.4u	5.4u
Cobalt	11.6u	11.6u	180j
Copper	[18.4]ub	4.0u	12600b
Iron	204	20.4u	1100
Lead	[2.4]	0.90u	1420
Magnesium	[2740]	165u	30800
Manganese	15.5uj	3.4u	8390b
Mercury	0.20u	0.20u	0.20u
Nickel	20.5u	20.5u	69.5j
Potassium	[1350]ub	537u	[1900]ub
Selenium	1.5u	1.5u	1.5uj
Silver	5.6u	5.6u	5.6u
Sodium	7480	1270u	10800
Thallium	1.8u	1.8u	1.8uj
Vanadium	[14.5]	11.3u	11.3u
Zinc	56.2	[17.8]	5020
Cyanide	10.0u	10.0u	10.0u

b - Material was detected in the laboratory blanks. Quantity reported is >5X the amount found in the blank (>10X for methylene chloride, acetone, toluene, and phthalates). A false positive result may exist.

j - The associated numerical value is an estimated quantity because the amount detected is below the contract required detection limit (CRDL) or because minor quality control criteria were not met. Presence of the material is reliable.

u - The material was analyzed for, but was not detected. The associated numerical value is the estimated sample quantitation limit or CRDL.
[] - The associated numerical value is an estimated quantity because the amount detected is below the contract required detection limit (CRDL). Presence of the material is reliable. (Inorganic data only).

TABLE 3
SEDIMENT DATA - INORGANIC ANALYSIS
BASIN MINING SITE
BASIN, MONTANA
TDD F08-8910-07 - PAN FMT0069SBA
CASE # 12329
(mg/kg or ppm)

SAMPLE ID #	BM-SE-1	BM-SE-2	BM-SE-3	BM-SE-4	BM-SE-5	BM-SE-6
TRAFFIC RPT #	MHL-934	MHL-935	MHL-936	MHL-937	MHL-938	MHL-954
LOCATION	BCKGRND BOULDER RIVER	DNSTRM JIB MILL	BCKGRND BASIN CREEK	CONFLNCE BASIN C/ BOULDER R	DNSTRM ATWATER COMPLEX	PONDED AREA BELOW SMELTER STACK
Aluminum	7640	8950	12300	9700	7250	7680
Antimony	10.1u	9.7u	11.8u	10.6u	10.1u	[10.2]
Arsenic	6.1	36.4	121	131	63.0	26.2
Barium	236	163	118	112	191	538
Beryllium	0.57u	0.55u	0.67u	0.60u	0.57u	0.50u
Cadmium	0.94u	0.91u	5.9	5.7	2.6	1.3
Calcium	2750	2420	2990	2400	2540	1270
Chromium	9.7b	19.6b	10.8b	7.7uj	13.1b	9.7b
Cobalt	[6.2]	[9.1]	[14.7]	[14.5]	[8.8]	[7.0]
Copper	14.9	114	95.7	78.8	104	447
Iron	9790	15800	20900	17700	14600	17100
Lead	8.6b	146b	148b	125b	66.9b	1300b
Magnesium	2920	5110	3690	3100	2760	1460
Manganese	304	372	1090	1240	499	209
Mercury	0.14	0.14u	0.17u	0.15u	0.14	0.21
Nickel	[8.5]	[6.4]	[12.1]	6.1u	[9.7]	5.1u
Potassium	2180	1890	2560	1950	2140	2580
Selenium	0.43u	0.41u	0.50u	0.45u	0.43u	0.37u
Silver	1.6u	5.6	[2.6]	1.7u	5.9	5.9
Sodium	[364]	350u	426	382u	364u	316u
Thallium	[1.2]uj	0.49u	0.60u	0.54u	0.51u	0.45u
Vanadium	20.5	26.0	42.8	30.6	30.5	28.7
Zinc	45.8	210	652	555	264	97.9
Cyanide	1.4u	1.4u	1.7u	1.5u	1.4u	1.2u
% Solid	70.4	72.9	59.9	66.8	70.0	80.7

b - Material was detected in the laboratory blanks. Quantity reported is >5X the amount found in the blank (>10X for methylene chloride, acetone, toluene, and phthalates). A false positive result may exist.

j - The associated numerical value is an estimated quantity because the amount detected is below the contract required detection limit (CRDL) or because minor quality control criteria were not met. Presence of the material is reliable.

u - The material was analyzed for, but was not detected. The associated numerical value is the estimated sample quantitation limit or CRDL.

[] - The associated numerical value is an estimated quantity because the amount detected is below the contract required detection limit (CRDL). Presence of the material is reliable. (Inorganic data only).

TABLE 4
SOIL DATA - INORGANIC ANALYSIS
BASIN MINING SITE
BASIN, MONTANA
TDD F08-8910-07 - PAN FMT0069SBA
CASE # 12329
(mg/kg or ppm)

SAMPLE ID #	BM-SO-1	BM-SO-2	BM-SO-3	BM-SO-4
TRAFFIC RPT #	MHL-945	MHL-946	MHL-947	MHL-948
LOCATION	BCKGRND WEST OF TOWN	JIB MILL TAILINGS	BASIN TAILINGS	ATWATER COMPLEX TAILINGS
Aluminum	16700	5750	2670	3580
Antimony	7.6u	7.5u	7.3u	7.4u
Arsenic	16.9	72.1	79.1	1640
Barium	263	174	47.3	83.3
Beryllium	0.43u	0.42u	0.41u	0.42u
Cadmium	1.9	1.9	0.68u	47.5
Calcium	5290	2320	[301]	7610
Chromium	16.5b	9.5b	4.4uj	10.1b
Cobalt	[10.4]	[8.1]	[2.4]	[7.4]
Copper	155	133	195	279
Iron	23100	23000	11800	19500
Lead	21.8b	274b	1310b	2710b
Magnesium	4810	1570	[250]	2020
Manganese	652	85.7	31.8	2860
Mercury	0.13	0.22	0.10u	0.47
Nickel	8.6	4.3u	4.2u	4.3u
Potassium	4310	2340	1650	1760
Selenium	0.32uj	[0.41]b	0.31u	0.31u
Silver	2.5	6.5	4.3	24.0
Sodium	272u	270u	264u	265u
Thallium	0.38u	0.38u	0.37u	0.37u
Vanadium	37.6u	32.0	15.5	[7.6]
Zinc	422	286	49.2	4240
Cyanide	1.1u	1.1u	1.0u	1.0u

TABLE 4 CONT.
SOIL DATA - INORGANIC ANALYSIS
BASIN MINING SITE
BASIN, MONTANA
TDD F08-8910-07 - PAN FMT0069SBA
CASE # 12329
(mg/kg or ppm)

b - Material was detected in the laboratory blanks. Quantity reported is >5X the amount found in the blank (>10X for methylene chloride, acetone, toluene, and phthalates). A false positive result may exist.

j - The associated numerical value is an estimated quantity because the amount detected is below the contract required detection limit (CRDL) or because minor quality control criteria were not met. Presence of the material is reliable.

u - The material was analyzed for, but was not detected. The associated numerical value is the estimated sample quantitation limit or CRDL.

[] - The associated numerical value is an estimated quantity because the amount detected is below the contract required detection limit (CRDL). Presence of the material is reliable. (Inorganic data only).

TABLE 4 CONT.
SOIL DATA - INORGANIC ANALYSIS
BASIN MINING SITE
BASIN, MONTANA
TDD F08-8910-07 - PAN FMT0069SBA
CASE # 12329
(mg/kg or ppm)

SAMPLE ID # TRAFFIC RPT # LOCATION	BM-SO-5 MHL-949 WWTP AREA	BM-SO-6 MHL-950 SMELTER AREA TAILINGS	BM-SO-7 MHL-951 HAGAR GARDEN SOIL	BM-SO-8 MHL-952 BASIN SCHOOL YARD
Aluminum	13000	3370	14400	3990
Antimony	8.2u	[11.7]	7.9u	7.2u
Arsenic	631	117	9.1j	990
Barium	221	65.3	175	102
Beryllium	0.46u	0.41u	0.45u	0.40u
Cadmium	25.9	3.0	[1.0]	10.9
Calcium	2810	[640]	4710	1610
Chromium	11.2b	3.6uj	8.5b	6.2uj
Cobalt	[5.0]	2.4u	[8.4]	[3.2]
Copper	852	17.0	57.3	913
Iron	17200	26500	14100	16200
Lead	1050b	196b	93.1b	169b
Magnesium	2160	[372]	3870	1120
Manganese	5950	18.2	538	96.9
Mercury	0.44	1.6	0.14	0.32
Nickel	[5.9]	4.2u	9.2	[4.5]
Potassium	2770	3940	2730	1310
Selenium	[0.35]	0.31u	0.33u	[0.78]
Silver	12.3	14.4	[1.5]	6.6
Sodium	296	2060	284u	258u
Thallium	0.42u	0.37u	0.40u	0.36u
Vanadium	20.9	[7.7]	24.7	24.9
Zinc	4120	15.7	194	1040
Cyanide	1.2u	1.0u	1.1u	1.0u

b - Material was detected in the laboratory blanks. Quantity reported is >5X the amount found in the blank (>10X for methylene chloride, acetone, toluene, and phthalates). A false positive result may exist.
j - The associated numerical value is an estimated quantity because the amount detected is below the contract required detection limit (CRDL) or because minor quality control criteria were not met. Presence of the material is reliable.
u - The material was analyzed for, but was not detected. The associated numerical value is the estimated sample quantitation limit or CRDL.
[] - The associated numerical value is an estimated quantity because the amount detected is below the contract required detection limit (CRDL). Presence of the material is reliable. (Inorganic data only).

APPENDIX A

DATA PACKAGES

INORGANIC ANALYSIS DATA SHEET

MHL954

Lab Name: DATACHEM, INC. Contract: 68-W8-0015

Lab Code: DATAC Case No.: 12329 SAS No.: SDG No.: MHL934

Matrix (soil/water): SOIL Lab Sample ID: CLP3194

Level (low/med): LOW Date Received: 07/17/89

% Solids: 80.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	7680			P	
7440-36-0	Antimony	$\boxed{10.2}$	~~B~~		P	LAF
7440-38-2	Arsenic	26.2			F	
7440-39-3	Barium	538			P	
7440-41-7	Beryllium	0.50	U		P	
7440-43-9	Cadmium	1.3	B		P	
7440-70-2	Calcium	1270			P	
7440-47-3	Chromium	9.7		B	P	LAF
7440-48-4	Cobalt	$\boxed{7.0}$	~~B~~		P	LAF
7440-50-8	Copper	44.7			P	
7439-89-6	Iron	17100			P	
7439-92-1	Lead	1300		B	F	LAF
7439-95-4	Magnesium	1460			P	
7439-96-5	Manganese	209			P	
7439-97-6	Mercury	0.21			CV	
7440-02-0	Nickel	5.1	U		P	
7440-09-7	Potassium	2580			P	
7782-49-2	Selenium	0.37	U		F	
7440-22-4	Silver	5.9			P	
7440-23-5	Sodium	316	U		P	
7440-28-0	Thallium	0.45	U		F	
7440-62-2	Vanadium	28.7			P	
7440-66-6	Zinc	97.9			P	
	Cyanide	1.2	U		AS	

lor Before: RED Clarity Before: Texture: COURSE

lor After: YELLOW Clarity After: Artifacts:

mments:

recycled paper ecology and environment

U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHL0[illegible]

Lab Name: DATACHEM, INC. Contract: 68-W8-0017

Lab Code: DATAC Case No.: 12329 SAS No.: SDG No.: MHL0[illegible]

Matrix (soil/water): SOIL Lab Sample ID: CLP2192

Level (low/med): LOW Date Received: [illegible]

% Solids: 89.8

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	14400			P	
7440-36-0	Antimony	7.9	U		P	
7440-38-2	Arsenic	9.1		S	F	
7440-39-3	Barium	175			P	
7440-41-7	Beryllium	0.45	U		P	
7440-43-9	Cadmium	[1.0]	~~U~~		P	LAF
7440-70-2	Calcium	4710			P	
7440-47-3	Chromium	8.5		B	P	LAF
7440-48-4	Cobalt	[8.4]	~~B~~		P	LAF
7440-50-8	Copper	57.3			P	
7439-89-6	Iron	14100			P	
7439-92-1	Lead	93.1		B	F	LAF
7439-95-4	Magnesium	3870			P	
7439-96-5	Manganese	538			P	
7439-97-6	Mercury	0.14			CV	
7440-02-0	Nickel	9.2			P	
7440-09-7	Potassium	2730			P	
7782-49-2	Selenium	0.33	U		F	
7440-22-4	Silver	[1.5]	~~U~~		P	LAF
7440-23-5	Sodium	284	U		P	
7440-28-0	Thallium	0.40	U		F	
7440-62-2	Vanadium	24.7			P	
7440-66-6	Zinc	194			P	
	Cyanide	1.1	U		AS	

Color Before: BROWN Clarity Before: Texture: COARSE

Color After: YELLOW Clarity After: Artifacts: YES

Comments:
ROOTS, GRASS

recycled paper

ecology and environment

15

EPA SAMPLE NO.

MHL952

INORGANIC ANALYSIS DATA SHEET

Lab Name: DATACHEM, INC. Contract: 68-W8-0015

Lab Code: DATAC Case No.: 12329 SAS No.: SDG No.: MHL93

Matrix (soil/water): SOIL Lab Sample ID: CLP3193

Level (low/med): LOW Date Received: 07/17/8

% Solids: 99.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	3990			P	
7440-36-0	Antimony	7.2	U		P	
7440-38-2	Arsenic	990			F	
7440-39-3	Barium	102			P	
7440-41-7	Beryllium	0.40	U		P	
7440-43-9	Cadmium	10.9			F	
7440-70-2	Calcium	1610			P	
7440-47-3	Chromium	6.2		W	P	LAF
7440-48-4	Cobalt	3.2	~~B~~		F	LAF
7440-50-8	Copper	913			P	
7439-89-6	Iron	16200			F	
7439-92-1	Lead	189		B	F	LAF
7439-95-4	Magnesium	1120			P	
7439-96-5	Manganese	96.9			P	
7439-97-6	Mercury	0.32			CV	
7440-02-0	Nickel	4.5	~~B~~		P	LAF
7440-09-7	Potassium	1310			P	
7782-49-2	Selenium	0.78	~~B~~		F	LAF
7440-22-4	Silver	6.6			P	
7440-23-5	Sodium	258	U		P	
7440-28-0	Thallium	0.36	U		F	
7440-62-2	Vanadium	24.9			P	
7440-66-6	Zinc	1040			P	
	Cyanide	1.0	U		AS	

Color Before: BROWN Clarity Before: Texture: COURSE

Color After: YELLOW Clarity After: Artifacts:

Comments:

recycled paper

ecology and environment

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

[illegible]

Lab Name: DATACHEM, INC. Contract: 68-W8-0015

Lab Code: DATAC Case No.: 12229 SAS No.: SDG No.: [illegible]

Matrix (soil/water): SOIL Lab Sample ID: [illegible]

Level (low/med): LOW Date Received: [illegible]

% Solids: 86.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	13000			P	
7440-36-0	Antimony	9.2	U		P	
7440-38-2	Arsenic	631			F	
7440-39-3	Barium	221			P	
7440-41-7	Beryllium	0.46	U		P	
7440-43-9	Cadmium	25.9			P	
7440-70-2	Calcium	2810			P	
7440-47-3	Chromium	11.2		B	P	UJ
7440-48-4	Cobalt	[5.0]	B		P	UJ
7440-50-8	Copper	852			P	
7439-89-6	Iron	17200			P	
7439-92-1	Lead	1050		B	F	UJ
7439-95-4	Magnesium	2160			P	
7439-96-5	Manganese	5950			P	
7439-97-6	Mercury	0.44			CV	
7440-02-0	Nickel	[5.9]	B		P	UJ
7440-09-7	Potassium	2770			P	
7782-49-2	Selenium	[0.35]	B		F	UJ
7440-22-4	Silver	12.3			P	
7440-23-5	Sodium	296	U		P	
7440-28-0	Thallium	0.42	U		F	
7440-62-2	Vanadium	20.9			P	
7440-66-6	Zinc	4120			P	
	Cyanide	1.2	U		AS	

olor Before: BROWN Clarity Before: Texture: COARSE

olor After: YELLOW Clarity After: Artifacts: YES

ents:
ROOTS, GRASS

recycled paper

ecology and environment

FORM I - IN

EPA

MHL956

INORGANIC ANALYSIS DATA SHEET

Lab Name: DATACHEM, INC. Contract: 68-W8-0015

Lab Code: DATAC Case No.: 12329 SAS No.: SDG No.: MHL931

Matrix (soil/water): SOIL Lab Sample ID: CLP3111

Level (low/med): LOW Date Received: 07/[illegible]/90

% Solids: 97.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	3370			P	
7440-36-0	Antimony	11.7	~~B~~		P	UAF
7440-38-2	Arsenic	117			F	
7440-39-3	Barium	65.3			P	
7440-41-7	Beryllium	0.41	U		P	
7440-43-9	Cadmium	3.0			P	
7440-70-2	Calcium	640	~~B~~		P	UAF
7440-47-3	Chromium	3.6		UJ	P	UAF
7440-48-4	Cobalt	2.4	U		P	
7440-50-8	Copper	17.0			P	
7439-89-6	Iron	26500			P	
7439-92-1	Lead	196		B	F	UAF
7439-95-4	Magnesium	372	~~B~~		P	UAF
7439-96-5	Manganese	18.2			P	
7439-97-6	Mercury	1.6			CV	
7440-02-0	Nickel	4.2	U		P	
7440-09-7	Potassium	3940			P	
7782-49-2	Selenium	0.31	U		F	
7440-22-4	Silver	14.4			P	
7440-23-5	Sodium	2060			P	
7440-28-0	Thallium	0.37	U		F	
7440-62-2	Vanadium	7.7	~~B~~		P	UAF
7440-66-6	Zinc	15.7			P	
	Cyanide	1.0	U		AS	

Color Before: YELLOW Clarity Before: Texture: COURSE

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MH1047

Lab Name: DATACHEM, INC. Contract: 68-W8-0015

Lab Code: DATAC Case No.: 12229 SAS No.: SDG No.: [illegible]

Matrix (soil/water): SOIL Lab Sample ID: [illegible]

Level (low/med): LOW Date Received: [illegible]

% Solids: 96.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	2670			P	
7440-36-0	Antimony	7.3	U		P	
7440-38-2	Arsenic	79.1			F	
7440-39-3	Barium	47.3			P	
7440-41-7	Beryllium	0.41	U		P	
7440-43-9	Cadmium	0.68	U		P	
7440-70-2	Calcium	301	~~B~~		P	LAF
7440-47-3	Chromium	4.4		W	P	LAF
7440-48-4	Cobalt	2.4	~~B~~		P	LAF
7440-50-8	Copper	195			P	
7439-89-6	Iron	11800			P	
7439-92-1	Lead	1310		B	F	LAF
7439-95-4	Magnesium	250	~~B~~		P	LAF
7439-96-5	Manganese	31.8			P	
7439-97-6	Mercury	0.10	U		CV	
7440-02-0	Nickel	4.2	U		P	
7440-09-7	Potassium	1650			P	
7782-49-2	Selenium	0.31	U		F	
7440-22-4	Silver	4.3			P	
7440-23-5	Sodium	264	U		P	
7440-28-0	Thallium	0.37	U		F	
7440-62-2	Vanadium	15.5			P	
7440-66-6	Zinc	49.2			P	
	Cyanide	1.0	U		AS	

Color Before: BROWN Clarity Before: Texture: COARSE

Color After: YELLOW Clarity After: Artifacts:

Comments:

EPA - CLP

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MHL048

Lab Name: DATACHEM, INC. Contract: 68-W8-0015

Lab Code: DATAC Case No.: 12329 SAS No.: SDG No.: MHL03

Matrix (soil/water): SOIL Lab Sample ID: CCP3189

Level (low/med): LOW Date Received: 07/17/89

% Solids: 96.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	3580			P	
7440-36-0	Antimony	7.4	U		P	
7440-38-2	Arsenic	1640			F	
7440-39-3	Barium	83.3			P	
7440-41-7	Beryllium	0.42	U		P	
7440-43-9	Cadmium	47.5			P	
7440-70-2	Calcium	7610			P	
7440-47-3	Chromium	10.1		B	P	LAF
7440-48-4	Cobalt	[7.4]	~~B~~		P	LAF
7440-50-8	Copper	279			P	
7439-89-6	Iron	19500			P	
7439-92-1	Lead	2710		B	F	LAF
7439-95-4	Magnesium	2020			P	
7439-96-5	Manganese	2860			P	
7439-97-6	Mercury	0.47			CV	
7440-02-0	Nickel	4.3	U		P	
7440-09-7	Potassium	1760			P	
7782-49-2	Selenium	0.31	U		F	
7440-22-4	Silver	24.0			P	
7440-23-5	Sodium	265	U		P	
7440-28-0	Thallium	0.37	U		F	
7440-62-2	Vanadium	[7.6]	~~B~~		P	LAF
7440-66-6	Zinc	4240			P	
	Cyanide	1.0	U		AS	

Color Before: BROWN Clarity Before: Texture: COURSE

Color After: YELLOW Clarity After: Artifacts:

Comments:

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EPA SAMPLE NO.

MHL947

INORGANIC ANALYSIS DATA SHEET

Lab Name: DATACHEM, INC. Contract: 68-W8-0015

Lab Code: DATAC Case No.: 12229 SAS No.: SDG No.: MHL9[illegible]

Matrix (soil/water): SOIL Lab Sample ID: [illegible]

Level (low/med): LOW Date Received: [illegible]

% Solids: 93.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	16700			P	
7440-36-0	Antimony	7.6	U		P	
7440-38-2	Arsenic	15.9			F	
7440-39-3	Barium	263			P	
7440-41-7	Beryllium	0.43	U		P	
7440-43-9	Cadmium	1.9			P	
7440-70-2	Calcium	5290			P	
7440-47-3	Chromium	16.5		B	P	LAF
7440-48-4	Cobalt	10.4	Z		P	LAF
7440-50-8	Copper	155			P	
7439-89-6	Iron	23100			P	
7439-92-1	Lead	21.8		B	F	LAF
7439-95-4	Magnesium	4810			P	
7439-96-5	Manganese	652			P	
7439-97-6	Mercury	0.13			CV	
7440-02-0	Nickel	8.6			P	
7440-09-7	Potassium	4310			P	
7782-49-2	Selenium	0.32	U	W UJ	F	LAF
7440-22-4	Silver	2.5			P	
7440-23-5	Sodium	272	U		P	
7440-28-0	Thallium	0.38	U		F	
7440-62-2	Vanadium	37.6			P	
7440-66-6	Zinc	422			P	
	Cyanide	1.1	U		AS	

Color Before: BROWN Clarity Before: Texture: COARSE

Color After: YELLOW Clarity After: Artifacts: YES

Comments:
ROOTS, GRASS

INORGANIC ANALYSIS DATA SHEET

Lab Name: DATACHEM, INC. Contract: 68-W8-0015

Lab Code: DATAC Case No.: 12329 SAS No.: SDG No.: [illegible]

Matrix (soil/water): SOIL Lab Sample ID: CLP3187

Level (low/med): LOW Date Received: 07/[illegible]

% Solids: 94.3

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	5750			P	
7440-36-0	Antimony	7.5	U		P	
7440-38-2	Arsenic	72.1			F	
7440-39-3	Barium	174			P	
7440-41-7	Beryllium	0.42	U		P	
7440-43-9	Cadmium	1.9			P	
7440-70-2	Calcium	2320			P	
7440-47-3	Chromium	9.5		B	P	LAF
7440-48-4	Cobalt	[8.1]	~~B~~		P	LAF
7440-50-8	Copper	133			P	
7439-89-6	Iron	23000			P	
7439-92-1	Lead	274		B	F	LAF
7439-95-4	Magnesium	1570			P	
7439-96-5	Manganese	85.7			P	
7439-97-6	Mercury	0.22			CV	
7440-02-0	Nickel	4.3	U		P	
7440-09-7	Potassium	2340			P	
7782-49-2	Selenium	[0.41]	~~B~~	B	F	LAF
7440-22-4	Silver	6.5			P	
7440-23-5	Sodium	270	U		P	
7440-28-0	Thallium	0.38	U		F	
7440-62-2	Vanadium	32.0			P	
7440-66-6	Zinc	286			P	
	Cyanide	1.1	U		AS	

Color Before: BROWN Clarity Before: Texture: COURSE

Color After: YELLOW Clarity After: Artifacts:

Comments:

recycled paper

ecology and environment

U.S. EPA - CLP

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MHL[illegible]

Lab Name: DATACHEM, INC. Contract: 68-W8-0015

Lab Code: DATAC Case No.: 12329 SAS No.: SDG No.: MHL[illegible]

Matrix (soil/water): SOIL Lab Sample ID: CL83184

Level (low/med): LOW Date Received: 07/[illegible]

% Solids: 56.8

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	9700			P	
7440-36-0	Antimony	10.6	U		P	
7440-38-2	Arsenic	131			F	
7440-39-3	Barium	112			P	
7440-41-7	Beryllium	0.50	U		P	
7440-43-9	Cadmium	5.7			P	
7440-70-2	Calcium	2400			P	
7440-47-3	Chromium	7.7		UJ	P	LAF
7440-48-4	Cobalt	14.5	~~B~~		P	LAF
7440-50-8	Copper	78.8			P	
7439-89-6	Iron	17700			P	
7439-92-1	Lead	125		B	F	LAF
7439-95-4	Magnesium	3100			P	
7439-96-5	Manganese	1240			P	
7439-97-6	Mercury	0.15	U		CV	
7440-02-0	Nickel	6.1	U		P	
7440-09-7	Potassium	1950			P	
7782-49-2	Selenium	0.45	U		F	
7440-22-4	Silver	1.7	U		P	
7440-23-5	Sodium	382	U		P	
7440-28-0	Thallium	0.54	U		F	
7440-62-2	Vanadium	30.6			P	
7440-66-6	Zinc	555			P	
	Cyanide	1.5	U		AS	

Color Before: BROWN Clarity Before: Texture: [illegible]

Color After: YELLOW Clarity After: Artifacts:

Comments:

MHL932

INORGANIC ANALYSIS DATA SHEET

Lab Name: DATACHEM, INC. Contract: 68-W8-0015

Lab Code: DATAC Case No.: 12329 SAS No.: SDG No.: MHL934

Matrix (soil/water): SOIL Lab Sample ID: CEL3185

Level (low/med): LOW Date Received: 07/17/89

% Solids: 70.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	7250			P	
7440-36-0	Antimony	10.1	U		P	
7440-38-2	Arsenic	63.0			F	
7440-39-3	Barium	191			P	
7440-41-7	Beryllium	0.57	~~B~~		P	
7440-43-9	Cadmium	2.6			P	
7440-70-2	Calcium	2540			P	
7440-47-3	Chromium	13.1		B	P	LAF
7440-48-4	Cobalt	$\boxed{8.8}$	~~B~~		P	LAF
7440-50-8	Copper	104			P	
7439-89-6	Iron	14600			P	
7439-92-1	Lead	66.9		B	F	LAF
7439-95-4	Magnesium	2760			P	
7439-96-5	Manganese	499			P	
7439-97-6	Mercury	0.14	U		CV	
7440-02-0	Nickel	$\boxed{9.7}$	~~B~~		P	LAF
7440-09-7	Potassium	2140			P	
7782-49-2	Selenium	0.43	U		F	
7440-22-4	Silver	5.9			P	
7440-23-5	Sodium	364	U		P	
7440-28-0	Thallium	0.51	U		F	
7440-62-2	Vanadium	30.5			P	
7440-66-6	Zinc	264			P	
	Cyanide	1.4	U		AS	

Color Before: BROWN Clarity Before: Texture: COURSE

Color After: YELLOW Clarity After: Artifacts:

Comments:

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EPA SAMPLE NO.

[illegible]

INORGANIC ANALYSIS DATA SHEET

Lab Name: DATACHEM, INC. Contract: [illegible]

Lab Code: DATAC Case No.: 12329 SAS No.: SDG No.: [illegible]

Matrix (soil/water): SOIL Lab Sample ID: [illegible]

Level (low/med): LOW Date Received: [illegible]

% Solids: 72.9

Concentration Units (ug/L or mg/kg dry weight): [illegible]

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	8950			P	
7440-36-0	Antimony	9.7	U		P	
7440-38-2	Arsenic	36.4			F	
7440-39-3	Barium	163			P	
7440-41-7	Beryllium	0.55	U		P	
7440-43-9	Cadmium	0.91	U		P	
7440-70-2	Calcium	2420			P	
7440-47-3	Chromium	19.6		B	P	LAF
7440-48-4	Cobalt	[9.1]	B		P	LAF
7440-50-8	Copper	114			P	
7439-89-6	Iron	15800			P	
7439-92-1	Lead	146		B	F	LAF
7439-95-4	Magnesium	5110			P	
7439-96-5	Manganese	372			P	
7439-97-6	Mercury	0.14	U		CV	
7440-02-0	Nickel	[6.4]	B		P	LAF
7440-09-7	Potassium	1890			P	
7782-49-2	Selenium	0.41	U		F	
7440-22-4	Silver	5.6			P	
7440-23-5	Sodium	350	U		P	
7440-28-0	Thallium	0.49	U		F	
7440-62-2	Vanadium	26.0			P	
7440-66-6	Zinc	210			P	
	Cyanide	1.4	U		AS	

Color Before: BROWN Clarity Before: Texture: [illegible]

Color After: YELLOW Clarity After: Artifacts:

Comments:

INORGANIC ANALYSES DATA SHEET

Lab Name: DATACHEM, INC. Contract: 68-W8-0015 [illegible]

Lab Code: DATAC[illegible] Case No.: 12329 SAS No.: [illegible] SDG No.: [illegible]

Matrix (soil/water): SOIL Lab Sample ID: [illegible]183

Level (low/med): LOW Date Received: [illegible]

% Solids: 59.9

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	12300			P	
7440-36-0	Antimony	11.8	U		P	
7440-38-2	Arsenic	121			F	
7440-39-3	Barium	118			P	
7440-41-7	Beryllium	0.67	U		P	
7440-43-9	Cadmium	5.9	?		P	
7440-70-2	Calcium	2990			P	
7440-47-3	Chromium	10.8		B	P	LAF
7440-48-4	Cobalt	[14.7]	~~B~~		P	LAF
7440-50-8	Copper	95.7			P	
7439-89-6	Iron	20900			P	
7439-92-1	Lead	148		B	F	LAF
7439-95-4	Magnesium	3690			P	
7439-96-5	Manganese	1090			P	
7439-97-6	Mercury	0.17	U		CV	
7440-02-0	Nickel	[12.1]	~~B~~		P	LAF
7440-09-7	Potassium	2560			P	
7782-49-2	Selenium	0.50	U		F	
7440-22-4	Silver	[2.6]	~~B~~		P	LAF
7440-23-5	Sodium	426	U		P	
7440-28-0	Thallium	0.60	U		F	
7440-62-2	Vanadium	42.8			P	
7440-66-6	Zinc	652			P	
	Cyanide	1.7	U		AS	

Color Before: BROWN Clarity Before: Texture: COURSE

Color After: YELLOW Clarity After: Artifacts:

Comments:

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

[illegible]

Lab Name: DATACHEM, INC.   Contract: 68-W8-0015

Lab Code: DATAC   Case No.: 12329   SAS No.:   SDG No.: MHL[illegible]

Matrix (soil/water): WATER   Lab Sample ID: CLP4105

Level (low/med): LOW   Date Received: 07/17/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	129	~~U~~	~~UB~~ U	P	LAF
7440-36-0	Antimony	35.4	U		P	
7440-38-2	Arsenic	[5.4]	~~B~~		F	LAF
7440-39-3	Barium	25.4	U		P	
7440-41-7	Beryllium	2.0	~~U~~	~~UB~~ U	P	
7440-43-9	Cadmium	3.3	U	~~E~~	P	LAF
7440-70-2	Calcium	14300			P	
7440-47-3	Chromium	13.8		UJ	P	LAF
7440-48-4	Cobalt	11.6	U		P	
7440-50-8	Copper	4.0	U		P	
7439-89-6	Iron	390			P	
7439-92-1	Lead	[1.0]	~~B~~		F	LAF
7439-95-4	Magnesium	[2770]	~~B~~		P	LAF
7439-96-5	Manganese	15.4		UJ	P	LAF
7439-97-6	Mercury	0.20	U		CV	
7440-02-0	Nickel	20.5	U		P	
7440-09-7	Potassium	[2310]	~~B~~	UB	P	LAF
7782-49-2	Selenium	1.5	U		F	
7440-22-4	Silver	5.6	U		P	
7440-23-5	Sodium	8610			P	
7440-28-0	Thallium	1.8	U		F	
7440-62-2	Vanadium	11.3	U		P	
7440-66-6	Zinc	20.8			P	
	Cyanide	10.0	U		AS	

Color Before: COLORLESS   Clarity Before: CLEAR   Texture:

Color After: COLORLESS   Clarity After: CLEAR   Artifacts:

Comments:
E ICP SERIAL DILUTION ANALYSIS IS OUTSIDE THE CONTROL LIMIT.

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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MBL029

Lab Name: DATACHEM, INC. Contract: 68-W8-0015

Lab Code: DATAC Case No.: 12329 SAS No.: SDG No.: MHL024

Matrix (soil/water): WATER Lab Sample ID: CLP3196

Level (low/med): LOW Date Received: 07/17/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	[135]	~~B~~		P	
7440-36-0	Antimony	[52.4]	~~B~~		P	
7440-38-2	Arsenic	10.0		S	F	LAF
7440-39-3	Barium	25.4	U		P	
7440-41-7	Beryllium	2.0	U		P	
7440-43-9	Cadmium	3.3	U	[illegible]	P	LAF
7440-70-2	Calcium	34000			P	
7440-47-3	Chromium	[5.9]	~~B~~		P	LAF
7440-48-4	Cobalt	11.6	U		P	
7440-50-8	Copper	[15.2]	~~B~~		P	LAF
7439-89-6	Iron	350			P	
7439-92-1	Lead	5.0			F	
7439-95-4	Magnesium	5980			P	
7439-96-5	Manganese	36.3			P	
7439-97-6	Mercury	0.20	U		CV	
7440-02-0	Nickel	20.5	U		P	
7440-09-7	Potassium	[2050]	~~B~~		P	LAF
7782-49-2	Selenium	1.5	U		F	
7440-22-4	Silver	5.6	U		P	
7440-23-5	Sodium	12800			P	
7440-28-0	Thallium	1.8	U		F	
7440-62-2	Vanadium	11.3	U		P	
7440-66-6	Zinc	65.0			P	
	Cyanide	10.0	U		AS	

olor Before: COLORLESS Clarity Before: CLEAR Texture:

olor After: COLORLESS Clarity After: CLEAR Artifacts:

mments:

ICP SERIAL DILUTION ANALYSIS IS OUTSIDE THE CONTROL LIMIT.

INORGANIC ANALYSIS DATA SHEET

MHE3[illegible]

Lab Name: DATACHEM, INC. Contract: 68-W8-0015

Lab Code: DATAC[illegible] Case No.: 12329 SAS No.: [illegible] SDG No.: MHL[illegible]

Matrix (soil/water): WATER Lab Sample ID: CLF3127

Level (low/med): LOW Date Received: 07/[illegible]/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	136			P	
7440-36-0	Antimony	62.5		W	P	LAF
7440-38-2	Arsenic	[9.7]	~~B~~		F	
7440-39-3	Barium	[133]	~~B~~		P	
7440-41-7	Beryllium	2.0	U		P	
7440-43-9	Cadmium	3.3	~~B~~	~~E~~	P	LAF
7440-70-2	Calcium	8270			P	
7440-47-3	Chromium	[8.8]	~~B~~	UB	P	LAF
7440-48-4	Cobalt	11.6	U		P	
7440-50-8	Copper	4.0	U		P	
7439-89-6	Iron	148			P	
7439-92-1	Lead	3.8			F	
7439-95-4	Magnesium	[1950]	~~B~~		P	LAF
7439-96-5	Manganese	[3.6]	~~B~~	UB	P	LAF
7439-97-6	Mercury	0.20	U		CV	
7440-02-0	Nickel	20.5	U		P	
7440-09-7	Potassium	[1310]	~~B~~	UB	P	LAF
7782-49-2	Selenium	1.5	U		F	
7440-22-4	Silver	5.6	U		P	
7440-23-5	Sodium	[3320]	~~B~~		P	LAF
7440-28-0	Thallium	1.8	U		F	
7440-62-2	Vanadium	11.3	U		P	
7440-66-6	Zinc	50.3			P	
	Cyanide	10.0	U		AS	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:
E ICP SERIAL DILUTION ANALYSIS IS OUTSIDE THE CONTROL LIMIT.

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHL[illegible]

Lab Name: DATACHEM, INC. Contract: 68-W8-0015

Lab Code: DATAC Case No.: 12329 SAS No.: SDG No.: MHL[illegible]

Matrix (soil/water): WATER Lab Sample ID: [illegible]

Level (low/med): LOW Date Received: 07/[illegible]

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	129	U		P	
7440-36-0	Antimony	[39.1]	~~B~~	UB	P	LAF
7440-38-2	Arsenic	10.0			F	
7440-39-3	Barium	25.4	U		P	
7440-41-7	Beryllium	2.0	U		P	
7440-43-9	Cadmium	3.2	U	I	P	LAF
7440-70-2	Calcium	8440			P	
7440-47-3	Chromium	5.4	U		P	
7440-48-4	Cobalt	11.6	U		P	
7440-50-8	Copper	[11.4]	~~B~~	UB	P	LAF
7439-89-6	Iron	178			P	
7439-92-1	Lead	[1.0]	~~B~~		F	LAF
7439-95-4	Magnesium	[2040]	~~B~~		P	LAF
7439-96-5	Manganese	[8.3]	~~B~~	UB	P	LAF
7439-97-6	Mercury	0.20	U		CV	
7440-02-0	Nickel	20.5	U		P	
7440-09-7	Potassium	537	U		P	
7782-49-2	Selenium	1.5	U		F	
7440-22-4	Silver	5.6	U		P	
7440-23-5	Sodium	[3220]	~~B~~		P	LAF
7440-28-0	Thallium	1.8	U		F	
7440-62-2	Vanadium	11.3	U		P	
7440-66-6	Zinc	44.3			P	
	Cyanide	10.0	U		AS	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:
E ICP SERIAL DILUTION ANALYSIS IS OUTSIDE THE CONTROL LIMIT.

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MHL93

INORGANIC ANALYSIS DATA SHEET

Lab Name: DATACHEM, INC. Contract: 68-W8-0015

Lab Code: DATAC Case No.: 12329 SAS No.: SDG No.: [illegible]

Matrix (soil/water): WATER Lab Sample ID: CLB3199

Level (low/med): LOW Date Received: 07/[illegible]/88

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	129	U		P	
7440-36-0	Antimony	[52.1]	~~B~~	UB	P	LAF
7440-38-2	Arsenic	[8.0]	~~B~~		F	LAF
7440-39-3	Barium	25.4	U		P	
7440-41-7	Beryllium	2.0	U		P	
7440-43-9	Cadmium	5.4		EUJ	P	LAF
7440-70-2	Calcium	13200			P	
7440-47-3	Chromium	[6.8]	~~B~~	UB	P	LAF
7440-48-4	Cobalt	11.6	U		P	
7440-50-8	Copper	(18.4)	~~B~~	UB	P	LAF
7439-89-6	Iron	204			P	
7439-92-1	Lead	[2.4]	~~B~~		F	LAF
7439-95-4	Magnesium	[2740]	~~B~~		P	LAF
7439-96-5	Manganese	15.5		UJ	P	LAF
7439-97-6	Mercury	0.20	U		CV	
7440-02-0	Nickel	20.5	U		P	
7440-09-7	Potassium	[1350]	~~B~~	UB	P	LAF
7782-49-2	Selenium	1.5	U		F	
7440-22-4	Silver	5.6	U		P	
7440-23-5	Sodium	7480			P	
7440-28-0	Thallium	1.8	U		F	
7440-62-2	Vanadium	[14.5]	~~B~~		P	LAF
7440-66-6	Zinc	56.2			P	
	Cyanide	10.0	U		AS	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:
E ICP SERIAL DILUTION ANALYSIS IS OUTSIDE THE CONTROL LIMIT.

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHL0[illegible]

Lab Name: DATACHEM, INC. Contract: 68-W8-0015

Lab Code: DATAC Case No.: 12329 SAS No.: SDG No.: MHL02[illegible]

Matrix (soil/water): WATER Lab Sample ID: CLP200[illegible]

Level (low/med): LOW Date Received: 07/17/8[illegible]

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	129	U		P	
7440-36-0	Antimony	48.7	~~B~~	uB	P	LAF
7440-38-2	Arsenic	2.2	U		F	
7440-39-3	Barium	25.4	U		P	
7440-41-7	Beryllium	2.0	U		P	
7440-43-9	Cadmium	3.3	U	E	P	LAF
7440-70-2	Calcium	215	U		P	
7440-47-3	Chromium	5.4	U		P	
7440-48-4	Cobalt	11.6	U		P	
7440-50-8	Copper	4.0	U		P	
7439-89-6	Iron	20.4	U		P	
7439-92-1	Lead	0.90	U		F	
7439-95-4	Magnesium	165	U		P	
7439-96-5	Manganese	3.4	U		P	
7439-97-6	Mercury	0.20	U		CV	
7440-02-0	Nickel	20.5	U		P	
7440-09-7	Potassium	537	U		P	
7782-49-2	Selenium	1.5	U		F	
7440-22-4	Silver	5.6	U		P	
7440-23-5	Sodium	1270	U		P	
7440-28-0	Thallium	1.8	U		F	
7440-62-2	Vanadium	11.3	U		P	
7440-66-6	Zinc	17.8	B		P	LAF
	Cyanide	10.0	U		AS	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:
E ICP SERIAL DILUTION ANALYSIS IS OUTSIDE THE CONTROL LIMIT.

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO. MHL4[illegible]

Lab Name: DATACHEM, INC. Contract: 68-W8-0015

Lab Code: DATAC Case No.: 12329 SAS No.: SDG No.: MHL92

Matrix (soil/water): WATER Lab Sample ID: CLP3201

Level (low/med): LOW Date Received: 07/1[illegible]/90

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	129	U		P	
7440-36-0	Antimony	115		UJ	P	LAF
7440-38-2	Arsenic	[2.4]	~~B~~		F	LAF
7440-39-3	Barium	[31.9]	~~B~~		P	LAF
7440-41-7	Beryllium	2.0	U		P	
7440-43-9	Cadmium	[4.1]	~~B~~	~~E~~ UJ	P	LAF
7440-70-2	Calcium	42200			P	
7440-47-3	Chromium	5.4	U		P	
7440-48-4	Cobalt	11.6	U		P	
7440-50-8	Copper	91.1		B	P	LAF
7439-89-6	Iron	118			P	
7439-92-1	Lead	0.90	U		F	
7439-95-4	Magnesium	11100			P	
7439-96-5	Manganese	3.4	U		P	
7439-97-6	Mercury	0.20	U		CV	
7440-02-0	Nickel	20.5	U		P	
7440-09-7	Potassium	[1220]	~~B~~	UB	P	LAF
7782-49-2	Selenium	1.5	U		F	
7440-22-4	Silver	5.6	U		P	
7440-23-5	Sodium	14000			P	
7440-28-0	Thallium	1.8	U		F	
7440-62-2	Vanadium	11.3	U		P	
7440-66-6	Zinc	32.2			P	
	Cyanide	10.0	U		AS	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:
E ICP SERIAL DILUTION ANALYSIS IS OUTSIDE THE CONTROL LIMIT.

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHL[illegible]

Lab Name: DATACHEM, INC. Contract: 68-W8-0015

Lab Code: DATAC Case No.: 12329 SAS No.: SDG No.: MHL[illegible]24

Matrix (soil/water): WATER Lab Sample ID: CLP32[illegible]2

Level (low/med): LOW Date Received: [illegible]

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	129	U		P	
7440-36-0	Antimony	36.7	~~B~~	UB	P	LAF
7440-38-2	Arsenic	2.4	~~B~~		F	LAF
7440-39-3	Barium	25.4	U		P	
7440-41-7	Beryllium	2.0	U		P	
7440-43-9	Cadmium	3.3	U	J	P	LAF
7440-70-2	Calcium	18100			P	
7440-47-3	Chromium	8.8	~~B~~	UB	P	LAF
7440-48-4	Cobalt	11.6	U		P	
7440-50-8	Copper	7.6	~~B~~	UB	P	LAF
7439-89-6	Iron	261			P	
7439-92-1	Lead	0.90	U		F	
7439-95-4	Magnesium	5510			P	
7439-96-5	Manganese	3.4	U		P	
7439-97-6	Mercury	0.20	U		CV	
7440-02-0	Nickel	22.8	B	J	P	LAF
7440-09-7	Potassium	1670	~~B~~	UB	P	LAF
7782-49-2	Selenium	1.5	U		F	
7440-22-4	Silver	5.6	U		P	
7440-23-5	Sodium	4950	~~B~~		P	LAF
7440-28-0	Thallium	1.8	U		F	
7440-62-2	Vanadium	11.3	U		P	
7440-66-6	Zinc	29.5			P	
	Cyanide	10.0	U		AS	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

E ICP SERIAL DILUTION ANALYSIS IS OUTSIDE THE CONTROL LIMIT.

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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MHL912

Lab Name: DATACHEM, INC. Contract: 68-W8-0015

Lab Code: DATAC Case No.: 12329 SAS No.: SDG No.: MHL024

Matrix (soil/water): WATER Lab Sample ID: CLP3203

Level (low/med): LOW Date Received: 07/17/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	129	U		P	
7440-36-0	Antimony	35.4	U		P	
7440-38-2	Arsenic	3.4	~~B~~		F	LAF
7440-39-3	Barium	25.5	~~B~~		P	LAF
7440-41-7	Beryllium	2.0	U		P	
7440-43-9	Cadmium	3.3	U	~~E~~	P	LAF
7440-70-2	Calcium	16800			P	
7440-47-3	Chromium	5.4	U		P	
7440-48-4	Cobalt	11.6	U		P	
7440-50-8	Copper	14.8	~~B~~	UB	P	LAF
7439-89-6	Iron	87.0	~~B~~		P	LAF
7439-92-1	Lead	0.90	U		F	
7439-95-4	Magnesium	5180			P	
7439-96-5	Manganese	3.9	~~B~~	UB	P	LAF
7439-97-6	Mercury	0.20	U		CV	
7440-02-0	Nickel	20.5	U		P	
7440-09-7	Potassium	1870	~~B~~	UB	P	LAF
7782-49-2	Selenium	1.5	U		F	
7440-22-4	Silver	5.6	U		P	
7440-23-5	Sodium	5000	~~B~~		P	LAF
7440-28-0	Thallium	1.8	U		F	
7440-62-2	Vanadium	11.3	U		P	
7440-66-6	Zinc	33.8			P	
	Cyanide	10.0	U		AS	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:
E ICP SERIAL DILUTION ANALYSIS IS OUTSIDE THE CONTROL LIMIT.

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EPA SAMPLE NO.

MHL943

INORGANIC ANALYSIS DATA SHEET

Lab Name: DATACHEM, INC. Contract: 68-W8-0015

Lab Code: DATAC Case No.: 12329 SAS No.: SDG No.: MHL[illegible]4

Matrix (soil/water): WATER Lab Sample ID: CLP32[illegible]

Level (low/med): LOW Date Received: 07/1[illegible]/8[illegible]

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	129	U		P	
7440-36-0	Antimony	35.4	U		P	
7440-38-2	Arsenic	2.2	U		F	
7440-39-3	Barium	41.1	~~B~~		P	LAF
7440-41-7	Beryllium	2.0	U		P	
7440-43-9	Cadmium	3.3	U	~~E~~	P	LAF
7440-70-2	Calcium	37100			P	
7440-47-3	Chromium	5.5	~~B~~	UB	P	LAF
7440-48-4	Cobalt	11.6	U		P	
7440-50-8	Copper	37.1		B	P	LAF
7439-89-6	Iron	153			P	
7439-92-1	Lead	1.1	~~B~~		F	
7439-95-4	Magnesium	9700			P	
7439-96-5	Manganese	3.4	U		P	
7439-97-6	Mercury	0.20	U		CV	
7440-02-0	Nickel	20.5	U		P	
7440-09-7	Potassium	2890	~~B~~	UB	P	LAF
7782-49-2	Selenium	1.5	U		F	
7440-22-4	Silver	5.6	U		P	
7440-23-5	Sodium	12100			P	
7440-28-0	Thallium	1.8	U		F	
7440-62-2	Vanadium	11.3	U		P	
7440-66-6	Zinc	299			P	
	Cyanide	10.0	U		AS	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

E ICP SERIAL DILUTION ANALYSIS IS OUTSIDE THE CONTROL LIMIT.

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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MHL944

Lab Name: DATACHEM, INC. Contract: 68-W8-0015

Lab Code: DATAC Case No.: 12329 SAS No.: SDG No.: MH

Matrix (soil/water): WATER Lab Sample ID: CLP3

Level (low/med): LOW Date Received: 07/1

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	129	U		P	
7440-36-0	Antimony	35.4	U		P	
7440-38-2	Arsenic	2.2	U		F	
7440-39-3	Barium	25.4	U		P	
7440-41-7	Beryllium	2.0	U		P	
7440-43-9	Cadmium	3.3	U	~~E~~	P	LAF
7440-70-2	Calcium	215	U		P	
7440-47-3	Chromium	5.4	U		P	
7440-48-4	Cobalt	11.6	U		P	
7440-50-8	Copper	4.0	U		P	
7439-89-6	Iron	$\boxed{24.3}$	~~B~~		P	LAF
7439-92-1	Lead	0.90	U		F	
7439-95-4	Magnesium	165	U		P	
7439-96-5	Manganese	3.4	U		P	
7439-97-6	Mercury	0.20	U		CV	
7440-02-0	Nickel	20.5	U		P	
7440-09-7	Potassium	537	U		P	
7782-49-2	Selenium	1.5	U		F	
7440-22-4	Silver	5.6	U		P	
7440-23-5	Sodium	1270	U		P	
7440-28-0	Thallium	1.8	U		F	
7440-62-2	Vanadium	11.3	U		P	
7440-66-6	Zinc	73.5			P	
	Cyanide	10.0	U		AS	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:
E ICP SERIAL DILUTION ANALYSIS IS OUTSIDE THE CONTROL LIMIT.

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EPA SAMPLE NO.

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INORGANIC ANALYSIS DATA SHEET

MHL953

Lab Name: DATACHEM, INC. Contract: 68-W8-0015

Lab Code: DATAC Case No.: 12329 SAS No.: SDG No.: MHL924

Matrix (soil/water): WATER Lab Sample ID: CLP3206

Level (low/med): LOW Date Received: 07/17/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

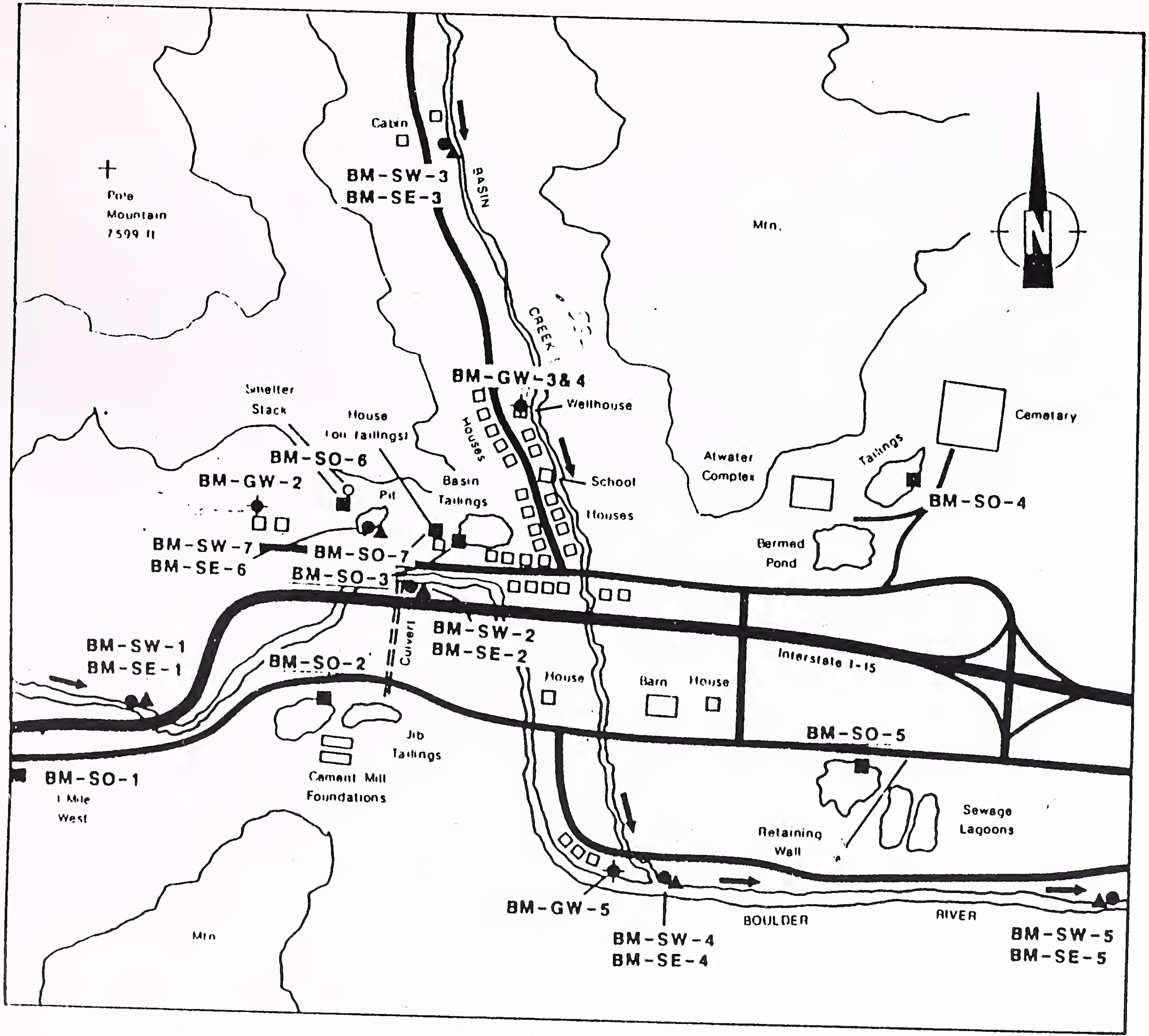
CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	5200			P	
7440-36-0	Antimony	35.4	U		P	
7440-38-2	Arsenic	[3.1]	~~B~~		F	LAF
7440-39-3	Barium	[31.3]	~~B~~		P	LAF
7440-41-7	Beryllium	[2.8]	~~B~~	UB	P	LAF
7440-43-9	Cadmium	237		~~N~~ J	P	LAF
7440-70-2	Calcium	170000			P	
7440-47-3	Chromium	5.4	U		P	
7440-48-4	Cobalt	180		J	P	LAF
7440-50-8	Copper	12600		B	P	LAF
7439-89-6	Iron	1100			P	
7439-92-1	Lead	1420			F	
7439-95-4	Magnesium	30800			P	
7439-96-5	Manganese	8390		B	P	LAF
7439-97-6	Mercury	0.20	U		CV	
7440-02-0	Nickel	69.5		J	P	LAF
7440-09-7	Potassium	[1900]	~~B~~	UB	P	LAF
7782-49-2	Selenium	1.5	~~U W~~	UJ	F	LAF
7440-22-4	Silver	5.6	U		P	
7440-23-5	Sodium	10800			P	
7440-28-0	Thallium	1.8	~~U W~~	UJ	F	LAF
7440-62-2	Vanadium	11.3	U		P	
7440-66-6	Zinc	5020			P	
	Cyanide	10.0	U		AS	

lor Before: COLORLESS Clarity Before: CLEAR Texture:

lor After: COLORLESS Clarity After: CLEAR Artifacts:

ments:
E ICP SERIAL DILUTION ANALYSIS IS OUTSIDE THE CONTROL LIMIT.

14



NOT TO SCALE

LEGEND

- ■ Soil sample
- ● Surface water sample
- ▲ Sediment sample
- ⯁ Domestic well

Note: High arsenic level found in the northwestern wall of schoolyard between Basin Creek and the school buildings.

FIELD INVESTIGATIONS OF UNCONTROLLED HAZARDOUS WASTE SITES
TASK REPORT TO THE E.P.A.

TITLE:

BASIN MINING SITE
Basin, Montana

SAMPLE LOCATION MAP

T.D.D. F08-8904-01

ecology & environment, inc.
DENVER, COLORADO

FIG 2

Date 08/89

CATARACT

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: CRESENT/ALSACE **PA#:** 22-106

Date: August 12, 1994 **Time:** 0930-1610

Field Team Leader: Tuesday, Pioneer

Sampling Personnel: Bisch, Flammang; Pioneer

Visitors: None

Weather/Seasonality Observations: Clear in the morning; cloudy in the afternoon; slight rain showers; hot (80°F); calm.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #9: Mill building; #10: Southwest side of TP-1; #11: TP-1 west of road and waste rock road; #12: TP-1 east of road; #13: SW-3 sample location; #14: WR-2 facing southeast; #15: WR-2 facing south; #16: WR-2 facing southwest; #17: WR-2 facing west; #18: Seep on WR-2; #19: Adit and collapsed portal building and pond, AD-1 sample location; #20: Discharge across WR-2; #21: WR-1 and empty tank. Video Tape No. 3

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: Empty barrels and empty fuel or chemical storage tank

General Comments on Potential Remedial Alternatives: Route adit discharge around dump. Route seeps around tailings and waste rock. Revegetate dumps and tailings.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): CRESENT/ALSACE **PA#:** 22-106

Legal Description: **T** 8N **;R** 5W **;Sec.** 29 **,** NE **1/4** NE **1/4** ____ **1/4**

County: JEFFERSON **Mining District:** CATARACT

Latitude: N 46° 25' 17" **Longitude:** W 112° 14' 45"

Primary Drainage Basin and Code: Boulder River/10020006
Secondary Drainage Basin: Cataract Creek

USGS Quadrangle map name(s): Chessman Reservoir

Mine Type/Commodities: Hardrock/Lead, Silver, Zinc, Gold

Activity Status: **Active** ___, **Inactive/Exploration** ___, **Abandoned** X.

Ownership: Known Y ___ **N** X **; private/public?** Private
Owner, Agent, or Contact (Include address and phone when available): Unknown

Relationship to other mines/sites in the area/district: Postulated to be on the same vein zone as the Ida May mine.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? N/A

General site features: Elevation 7700'-7800', **Slope** < 5°,
Aspect East

Land use: Mining X, **Recreational** X, **Residential** ___, **Urban** ___,
Agricultural X, **Other(Specify)** ___

Area of disturbed/unvegetated lands? Approx. 5 **acre(s).**
Site Dimensions: 100 feet x 500 feet

Predominant vegetation types: Lodgepole pine, Engelmann spruce, Douglas fir

Access: roads - good (paved) ___, **poor (maintained dirt road)** ___,
4wd X, **trail** ___.
Other logistical considerations (proximity to other sites). On same road as Peerless Jenny/King and Queensbury sites; 3/4 mile west of Ida May shaft; 2 miles east of Josephine mine.

Well logs within 1 mile radius; (Attach MBMG Well Log Printout(s)): There are no wells reported within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site is underlain by quartz monzonite of the Boulder batholith. Site lies on an unnamed tributary in the headwater region of Cataract Creek. The unnamed tributary flows southeast through the site and then into Cataract Creek approximately 1/2 mile downgradient. Cataract Creek flows south to confluence with the Boulder River 14 miles away.

Mining/milling history, ore type/tenor, host rock, gangue: Worked in the 1890s, and Cresent mine was worked again in the 1950s. Production records from 1935 to 1956 indicate 339 tons of ore was shipped that yeilded 190 oz. gold, 3,392 oz. silver, 5,466 lbs. copper, 45,934 lbs. lead, and 15,138 lbs. zinc. Vein mineralization occurs as argentiferous galena, sphalerite, chalcopyrite and pyrite.

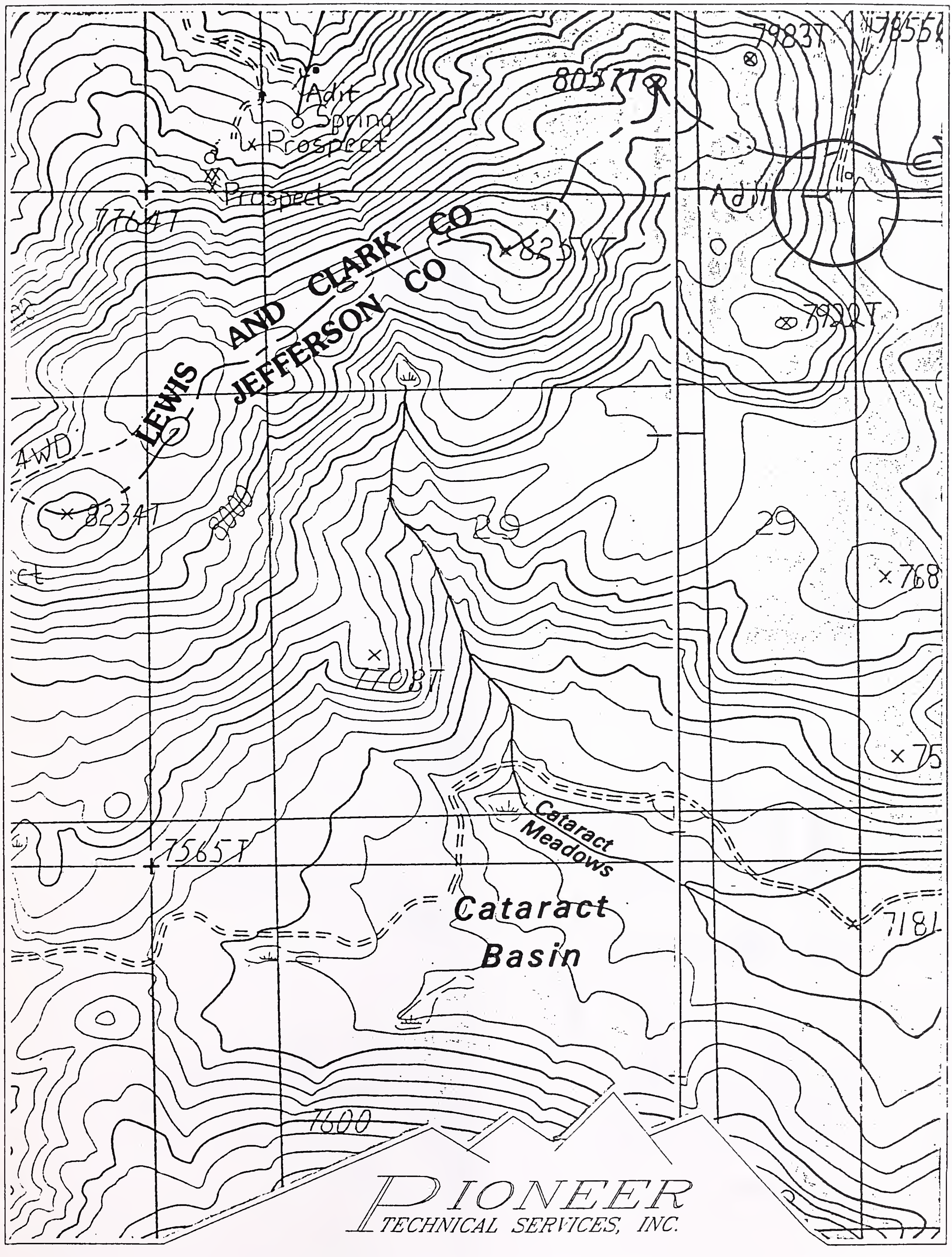
Mine Operation?
Shafts - Yes_X_, No___, # _1_, Comment Caved
Adits - Yes_X_, No___, # _1_, Comment Discharging
Pits - Yes___, No_X_, # ___, Comment
Placers - Yes___, No_X_, # ___, Comment
Other - Yes___, No_X_, # ___, Comment

Mill Operation? Yes_X_, No___. If yes answer the next three questions:

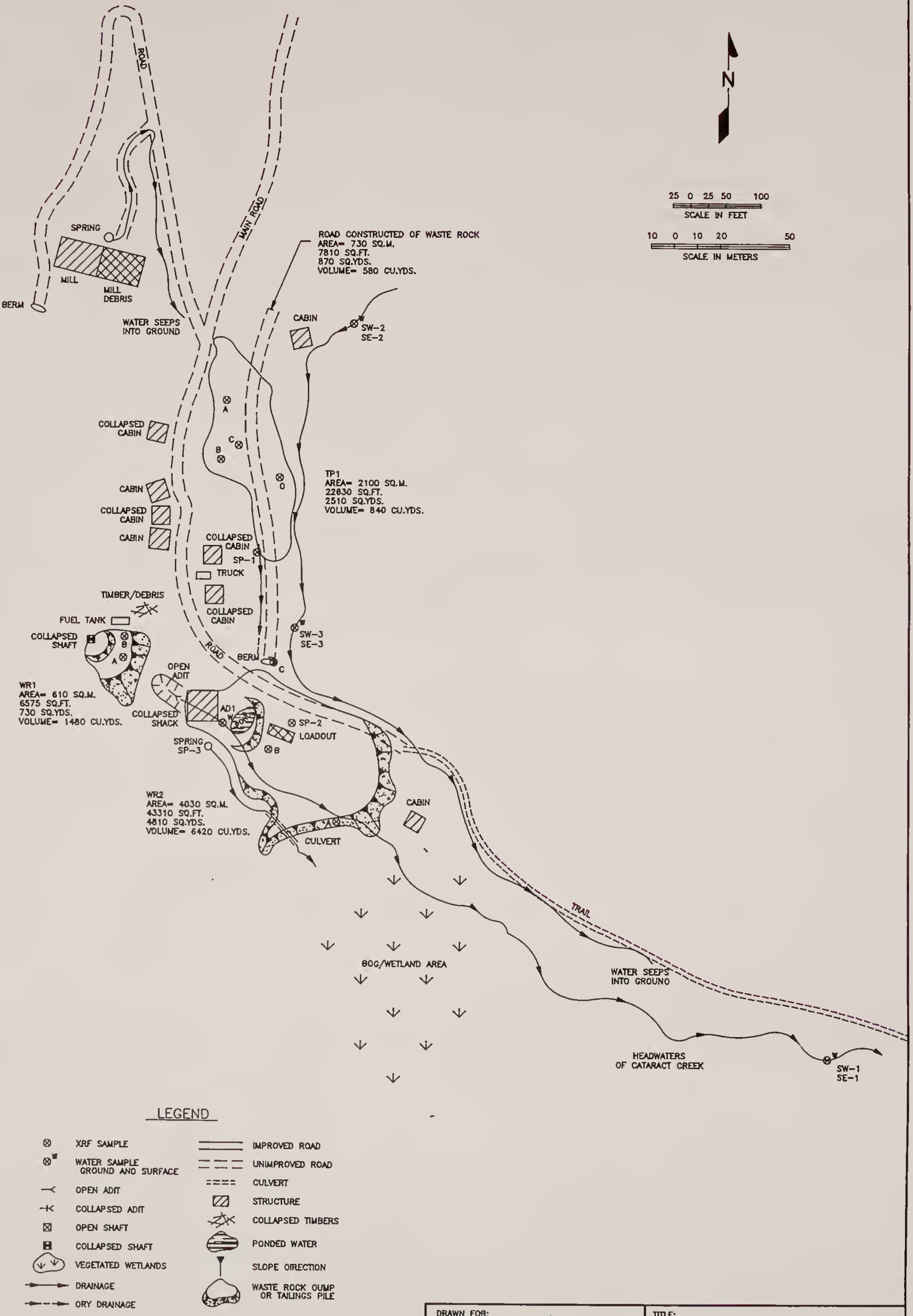
Period(s) of Operation: Built in 1954

Origin of Ore Milled - Custom Mill___ Dedicated Mill_X_; Number and names of mines that supplied mill feed: Cresent and possibly Ida May

Process? Hg-amalgam, CN⁻ leach (vat, heap), floatation, smelting?
Floatation mill



CRESENT/ALSACE, P.A. NO. 22-106
T08N, R05W, SECTION 29
SCALE: 1" = 1000'



DRAWN FOR:

PIONEER
TECHNICAL SERVICES, INC.

TITLE:

CRESENT/ALSACE
PA# 22-106

DRAWING NO.: PT340248 REV: –
DATE: 11/18/94 PLOT SCALE: 1 = 40

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. **Waste Characteristics** - *Use table on following page.*

Unique source identification: (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures/vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. **TAILINGS IMPOUNDMENTS** - *If tailings impoundments are also present, complete the following questions.*

Describe the tailings grain size distribution (approximate % sand, silt, & clay): 50% sand, 20% clay, 30% silt

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): Average of 1 foot deep; no obvious stratification.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Dry

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): No real impoundment; tailings run down road ditch. Road made of waste rock is built on tailings.

Comments on potential for mitigation: Partially revegetated; cover, amend, and revegetate. However, tailings may require disposal in an alternate location due to placement in a drainage and shallow groundwater.

SOURCE INVENTORY FORM

SAMPLERS: Tuesday, Flammang

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1A	WR	1,460	Upper dump; center	None	4.5 (D)	0.05	22-106-WR-1	08/12/94 1530	T-Metals, ABA
WR-1B	WR		Upper dump; north end	None	5.0 (D)	0.05			
WR-2A	WR	6,420	Lower dump; where adit discharge flows to creek	None	3.5 (D)	0.03			
WR-2B	WR		Lower dump; under loadout	None	< 3.5 (D)	0.05			
WR-2C	WR		Lower dump; at berm at south end of road	None	< 3.5 (D)	0.03			
TP-1A-1	TAIL	840	Northwest end of TP-1; 0-2"	None	4.1 (D)	0.045	22-106-TP-1	08/12/94 1535	T-Metals, ABA, Cyanide
TP-1A-2	TAIL		2-13"	None	6.4 (D)	0.04			
TP-1B-1	TAIL		Southwest end of TP-1; 0-2"	None	3.8 (D)	0.035			
TP-1B-2	TAIL		2-7"	None	6.5 (D)	0.03			
TP-1B-3	TAIL		Soil below tailings	None	6.3 (D)	0.03	N/A	N/A	XRF Analysis
TP-1C	TAIL		West of road, northwest end; 0-18"	None	6.25 (D)	0.035			
TP-1D	TAIL		East of road, south end; 0-8"	None	5.9 (D)	0.04			

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-106-WR-1 is composite of WR-1A and -1B, and WR-2A through -2C. 22-106-TP-1 is composite of TP-1A-1, -1A-2, -1B-1, -1B-2, -1C, and -1D. See Josephine (22-031) for background soil sample.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: **Yes** X , **No** ___, **Number:** 1 **Identification:** AD-1

Filled shafts: **Yes** ___, **No** X , **Number:** ___ **Identification:** ___

Seeps/Springs: **Yes** X , **No** ___, **Number:** 3 **Identification:** South of tailings along road; on WR-2; seep south of Adit #1

Groundwater wells within 4 miles?: **Yes** X , **No** ___;
Number of well logs: 18

Distance to nearest well used for drinking:
___<1,000 ft; ___1,000 ft to 0.5 miles; X >0.5 miles.

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite ___, **Probable** ___, **Possible** X , **Unlikely** ___.
Uncontained sources; very shallow groundwater.

Approximate Depth to Groundwater: X <25 ft; ___ 25 - 100 ft; ___ >100 ft.

Other observations/notes: Adit discharge and many springs in the area. When mine was operating, pumping costs were high.

GROUNDWATER INVENTORY FORM

SAMPLERS: Flammang

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
AD-1	AD	Adit discharge onto WR-2	2 gpm (E)	4.04	376	NM	8.9	0	N/A	22-106-AD-1	08/12/94 1220	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SP-1	SP	Seep on west side of road below tailings	< 1 gpm (E)	6.85	234	NM	21.5	NM	N/A	N/A	N/A	Field Parameters
SP-2	SP	Seep on WR-2; east of loadout	< 0.5 gpm (E)	7.92	170	NM	17.3	46	N/A	N/A	N/A	Field Parameters
SP-3	SP	Seep south of adit building	< 0.5 gpm (E)	6.3	100	NM	19.9	27	N/A	N/A	N/A	Field Parameters

*FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): NM = Not Measured

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: **Yes** X , **No** ___, **Name(s):** Headwaters of Cataract Creek

Dry streambeds: **Yes** ____, **No** X , **Name(s):** ________

Other surface water: **Yes** X , **No** ____, **Name(s)/Description:** Adit discharge

Waste materials within any floodplain: **Yes** X , **No** ___ **Source ID(s):** WR-2, TP-1

Approximate Flood frequency? X **1 yr,** ___**10 yr,** ___**100 yr**

Estimated seasonal flow of stream(s) (cfs/gpm)? 1 gpm
High Flow: 10 gpm , **Average Flow:** 1 gpm

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: **Yes** X , **No** ____,
Describe: Adit discharge onto WR-2

Surface water use within 15 miles downstream? **(Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)**
Cataract Creek has fishery, stock watering, and possible irrigation; Boulder River has fishery, recreation, agriculture, and irrigation.

Observed erosional/sedimentation/stream turbidity problems? **Yes** X ,
No ______. **Distance downstream (ft)? 0-500**___; **500-1,000**___; **>1,000** X .
Describe/explain **(Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):** Iron-staining more than 1,000 feet downstream.

SURFACE WATER INVENTORY FORM

SAMPLERS: Flammang, Bisch

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC $\mu S/cm$ @ 25°C	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	Downstream of site in Cataract Creek	8.02	125	20.3	7	20 gpm (E)	22-106-SW-1	08/12/94 1340	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-1	SE	Downstream of site in Cataract Creek	N/A	N/A	N/A	N/A	N/A	22-106-SE-1	08/12/94 1340	T-Metals
SW-2	SW	Upgradient of mine/tailings 60' above cabin	6.51	84	11.3	44	1 gpm (E)	22-106-SW-2	08/12/94 1300	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-2	SE	Upgradient of mine/tailings 60' above cabin	N/A	N/A	N/A	N/A	N/A	22-106-SE-2	08/12/94 1300	T-Metals
SW-3	SW	Downgradient of tailings in stream let by road (east side)	6.16	89	12.2	36	1 gpm (E)	22-106-SW-3	08/12/94 1330	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-3	SE	Downgradient of tailings in stream let by road (east side)	N/A	N/A	N/A	N/A	N/A	22-106-SE-3	08/12/94 13[illegible]0	T-Metals
SW-4	BLANK	QA/QC sample	N/A	N/A	N/A	N/A	N/A	22-106-SW-4	08/12/94 1400	T-Metals
SE-500	SE	500' below SE-1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis
SE-1000	SE	1,000' below SE-1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ______

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides? (SO_3)

Presence of evaporative salt deposits? (ESD)

Discolored or turbid seepage? (SPG)

Presence of long filamentous algae in drainages, mosses in moist areas?

Presence of ferric hydroxide precipitates? (FEOX)

Presence of burned or stressed vegetation? (VEG)

pH ≤ 5.0 (pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 3 acres

Wetlands present: Yes X **, No** ___ **, Describe:** Below dumps, approximately 1 acre of swamps

Carbonate rocks/soils: Yes ___ **, No** X **, Describe:** ___

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 ___ **; 10-30** X **; 30-100** ___ **; 100-300** ___ **; 300-1,000** ___ **; 1,000-3,000** ___ **; 3,000-10,000** ___ **; 10,000 or greater** ___ **; Comments** ___

Nearest residence: ___ **<1,000 ft;** ___ **1,000 ft - 0.5 miles;** X **>0.5 miles.**

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Tuesday, Flammang

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
WR-1	pH; FEOX; Sulfides	Dry	6,575	6,575	Yes	Low
WR-2	pH; FEOX; Sulfides	Partial	43,310	43,310	Yes	Low
TP-1	pH	Dry	22,630	8,100	Yes	Moderate
AD-1	FEOX	N/A	N/A	N/A	N/A	N/A

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No X , Describe:____

Population within 1 mile: 1-10 X ; 10-30___; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments____

Evidence of recreational use on site: Yes X , No___, Describe: Gun shells; campfire rings; beer cans

Accessibility (check each that apply): X Easily accessible - no fences, gates, or warning signs;___Moderately Accessible - barbed wire fences, road gated, or signs posted;___Difficult Access - chain-link fence, road gated and locked, site guarded (does not include locked or manned access points located more than 0.5 miles from the actual site).

Sensitive environments on-site or adjacent to site:
State or National Parks - Yes___, No X , Comment____
Wilderness Area - Yes___, No X , Comment____
T&E Species Habitat - Yes___, No X , Comment____
Bat Habitat - Yes___, No X , Comment____

Primary Drainage___; Secondary Drainage X ; No Information___:
Riparian Habitat Quality - High___, Medium X , Low___
Wetlands Frontage - High___, Medium___, Low X
Fisheries Habitat and Species Classification - 4
Sport Fishery Classification - 4

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X , No___, Number 1 , types and locations: Adit is slightly open.

Hazardous structures: Yes X , No___, Number 3 , types and locations: Cabins and loadout

Unstable highwalls, pits, trenches, slopes: Yes___, No X , Number____, types and locations:____

Unstable waste piles, impoundments, undercut banks: Yes____, No X , Number____, types and locations:____

Fire and/or Explosion hazards: Yes___, No X , Explain:____

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LABORATORY ANALYTICAL DATA

CRESENT/ALSACE
PA NO. 22-106

Cresent/Alsace PA# 22-106
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 08/12/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-106-SE1	1.5 U	15.0	55.2	6.3	30.1	11.5	903	26300	0.08	2170	5.0 U	441	18.0 UJ	1200	NR
22-106-SE2	1.1 U	8.4 U	62.0	1.0 U	5.4	8.9	13.8	13800	0.04	307	3.6 U	11.0 U	12.9 UJ	31.2	NR
22-106-SE3	1.4 U	23.9	89.2	29.9	45.6	8.0	529	20800	0.06	4880	4.6 U	793	16.3 UJ	2580	NR
22-106-TP1	32.6	131 J	14.1	3.67	2.25	4.16 J	356	18500	0.103	165	4.5	4570	10.2 UJ	618	<0.285
22-106-WR1	35.8	218	22.5	0.7 U	1.5 U	4.5	583	41300	0.29	216	2.6 U	5820	9.4 UJ	340	NR
BACKGROUND	1.0 U	84.1 J	67.8 J	1.0 UJ	2.5 B	2.5 J	55.9	7500 JX	0.24 JX	442 J	3.5 U	53.3	12.5 UJ	57.6	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-106-TP1	0.21	6.56	-1.51	-8.1	0.13	0.04	0.04	1.25	-2.76
22-106-WR1	0.75	23.4	-3.35	-27	0.62	0.06	0.07	1.87	-5.22

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-106-AD1	0.12	2.8	17.0	133	42.2	6.8 U	2820	602	0.18	1960	31.5	673	51.6 U	22400	85.2
22-106-SW1	0.12 U	1.1 U	14.8	24.6	13.8	6.8 U	54.2	112	0.17	904	14.4 U	16.6	51.6 U	3350	42.0
22-106-SW2	0.12 U	2.1	24.5	4.0 U	8.4 U	6.8 U	5.9 U	903	0.21	56.1	14.4 U	4.1	51.6 U	15.6 U	38.5
22-106-SW3	0.28	2.4	24.6	5.7	9.5	6.8 U	80.2	1380	0.18	619	14.4 U	100	51.6 U	539	42.1
22-106-SW4	0.12 U	1.1 U	5.5 U	4 U	8.4 U	6.8 U	5.9 U	12.3 U	0.19	2.3 U	17.0	1.3	51.6 U	15.6 U	0.1 U

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-106-AD1	218	<5	151	<0.05	NR
22-106-SW1	27	<5	40	<0.05	NR
22-106-SW2	25	<5	6.0	<0.05	NR
22-106-SW3	19	<5	6.0	<0.05	NR

LEGEND

SE1 - Downstream of site in Cataract Creek.
SE2 - Upgradient of mine/tailings 60' above cabin.
SE3 - Downgradient of tailings in streamlet by road (east side).
TP1 - Composite of subsamples TP1A-1 through TP1D without TP1B-3.
WR1 - Composite of subsamples WR1A, 1B, and WR2A through 2C.
BACKGROUND - From the Josephine Mine (22-031-SS1).

AD1 - Adit discharge onto WR2.
SW1 - Same as sample 22-106-SE1.
SW2 - Same as sample 22-106-SE2.
SW3 - Same as sample 22-106-SE3.
SW4 - QA/QC sample.

XRF ANALYSIS RESULTS

CRESENT/ALSACE
PA NO. 22-106

MDSL AMRB/PIONEER 5/16/94

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

CRESENT/ALSACE
PA NO. 22-106

Mine Name: Cresent/Alsace PA# 22-106
XRF Field Analyses
Results in PPM

XRF SAMPLE I.D.	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Ni	Cu	Zn	As	Sr
22-106-SE1000		17084.2	9587.04	2288.4		2244.13	24662.7			128.24 *	1352.52		363.244
22-106-SE500		12593.4	3024.2	1104.89		1966.33 *	28749.5			3001.12	6800.3		61.1135
22-106-TP1A1		28921.6	3370.44	1935.2		528.734 *	23619			444.194	321.82		73.1638
22-106-TP1A2		22322.5	1725.31	1177.68		488.469 *	18899.9			192.645 *	200.699 *		26.3494
22-106-TP1B1		16798.6	1866.68	1504.88		568.552 *	22850.7			131.693 *	236.182 *		85.9922
22-106-TP1B2		19625.1	1944.01	1220.6			12775.3				427.793		18.5321 *
22-106-TP1B3		4304.51	2402.95	617.843 *			16090	366.185 *		1327.36	1013.17	206.02 *	37.662 *
22-106-TP1C		19053.5	1966.19	1049.93		427.864 *	13595.1				1114.5		31.1201 *
22-106-TP1D		23311	1668.28	1155.73			33378.5			446.909	425.604		23.2385 *
22-106-TP1-COMP		22479.4	2097.85	1318.78		564.933 *	16320.4			101.398 *	607.505		36.6357 *
22-106-WR1A		23661.3	1275.56	293.876 *		560.226 *	66941.5			178.302 *	118.335 *		105.9
22-106-WR1B		36714.3	2130.1	1394.44		710.098 *	63253.9			140.039 *	145.018 *	273.11 *	82.9218
22-106-WR1-COMP		34237.6	2373.39	953.223		805.039 *	62749.5			331.425 *	382.077		73.9075
22-106-WR2A		31013.8	2027.95	1305.45		883.294 *	49698.3			415.226 *	539.731		98.3008
22-106-WR2B		36590	1973.26	902.142		1401.69 *	53745.6			758.96	455.929		26.6484 *
22-106-WR2C		33563.1	1898.23	1372.17		788.72 *	54505.6			710.312	637.865		57.8087

XRF SAMPLE I.D.	Zr	Hg	Mo	Pb	Rb	Cd	Sn	Sb	Ba	Ag	U	Th
22-106-SE1000	398.196			67.8251 *	165.276				478.829			13.4577 *
22-106-SE500	26.2781 *			2591.78	112.452				44.8925 *			20.3212 *
22-106-TP1A1	184.68		13.5525 *	5130.67	169.964				221.381			39.9202 *
22-106-TP1A2	84.4684		12.4561 *	3596.78	165.648				97.2804			
22-106-TP1B1	102.942			2028.48	139.676				243.277			
22-106-TP1B2	83.9072		13.9363 *	4021.6	153.568	154.132 *			76.8325 *			48.4962 *
22-106-TP1B3	40.9062			673.724	65.3062 *				61.4272 *			
22-106-TP1C	71.2548		10.5366 *	1939.01	162.149				116.113 *			19.9744 *
22-106-TP1D	49.9375		16.3036 *	4662.25	218.699				215.809			26.4318 *
22-106-TP1-COMP	86.2842		19.1673 *	3426.64	153.19				180.288			39.9966 *
22-106-WR1A	131.269		19.372 *	3581.34	268.889				314.101			27.4878 *
22-106-WR1B	149.159		14.3351 *	1377.29	288.901				240.985			17.8119 *
22-106-WR1-COMP	128.306		16.647 *	3584.87	277.194				292.063			
22-106-WR2A	108.389		10.2674 *	3484.85	264.063				356.125			27.0204 *
22-106-WR2B	72.7963		32.5054 *	6396.66	249.88				157.949			44.6939 *
22-106-WR2C	152.261		11.5276 *	5793.58	238.872				276.313			

* = Estimated Quantity

$ = Unvalidated Data

AIMSS SCORESHEET

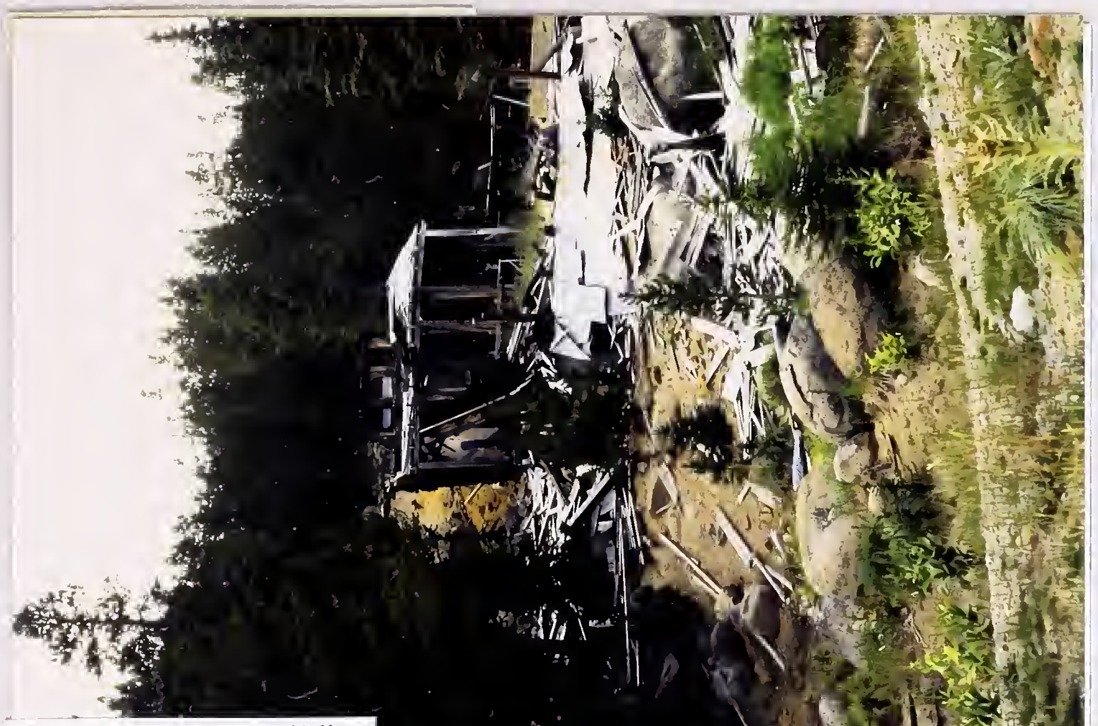
SITE NAME: Cresent/Alsace
PA NUMBER: 22-106

LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	19.988
6	GW - TARGETS	WELLS - 1 MI. x 2.5		0.0
7		WELLS - 1 TO 4 MI		18
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	18.0
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	143914
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		300
12		EXCEEDENCES		100
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	800
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	22.235
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		1
18		WETLANDS		10
19		FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	19
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	337972
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		5
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	25
27		LIKELIHOOD SCORE	LINES 25 + 26C	25
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.163
29	AIR - TARGETS	POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31		WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	10
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	291
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		50
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	150
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.047
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		1
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		10
43		TARGETS SCORE	SUM LINES 40 THRU 42	11
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	1728
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE	(LINES 10 + 24 + 35 + 44) / 100,000		4.84

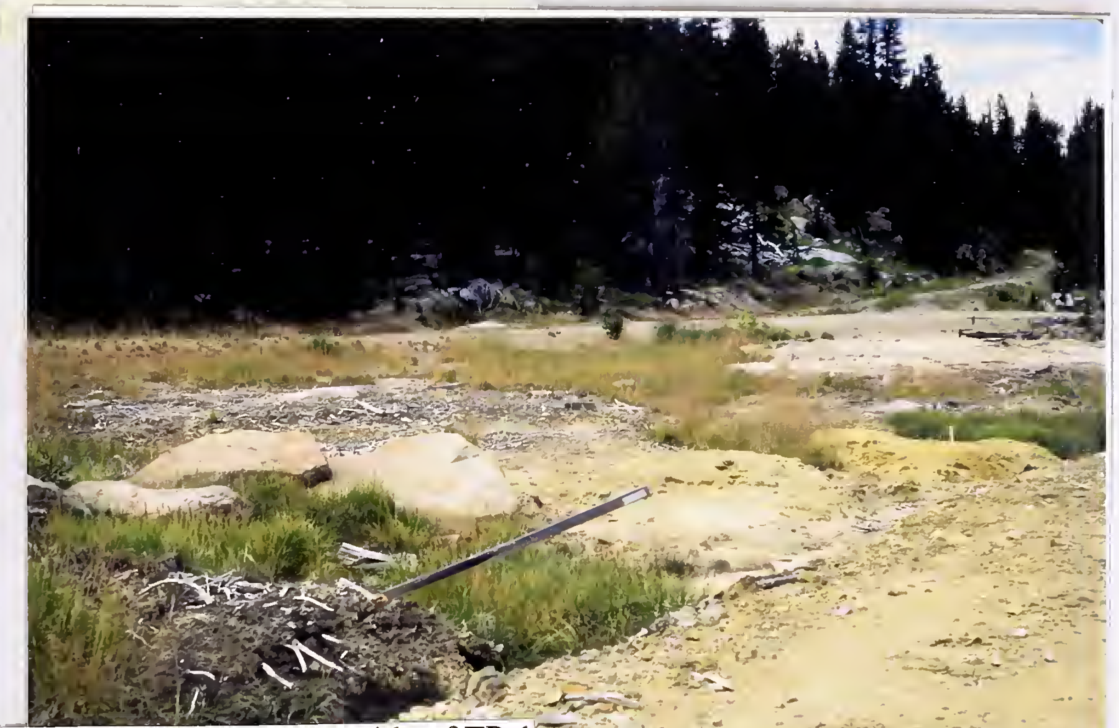
SITE NAME: Cresent/Alsace
PA NUMBER: 22-106

SITE SAFETY

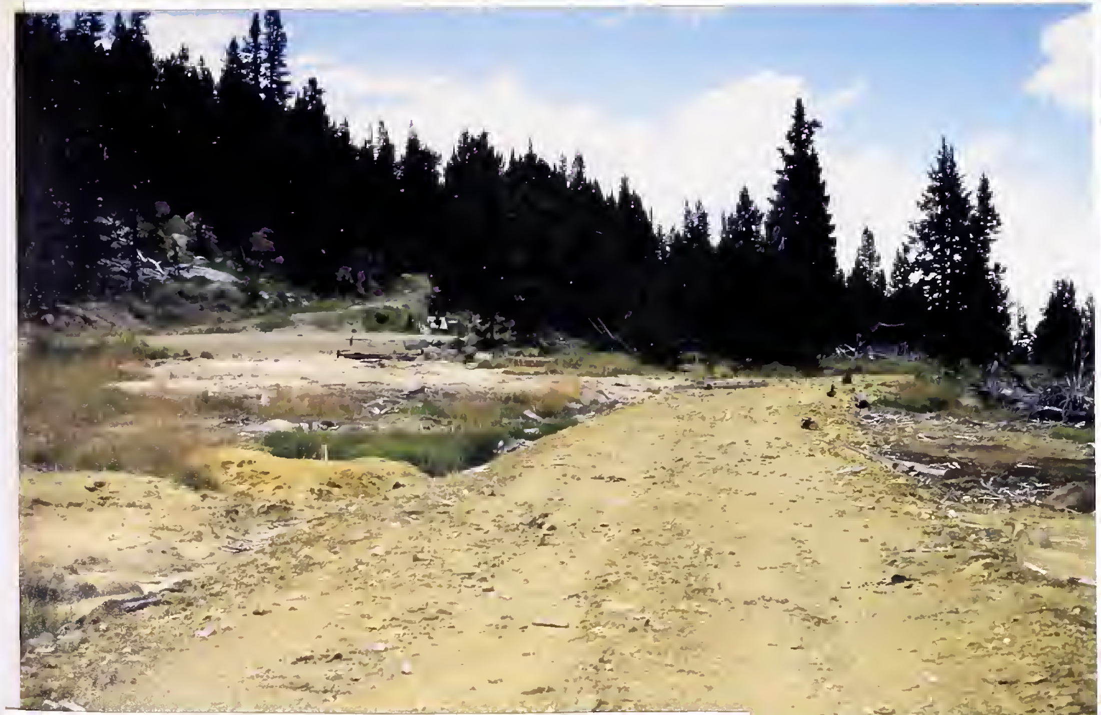
LINE NO.				
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	50
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	120
6		EXPLOSIVES		100
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	270
9		POPULATION - 1 MILE		1
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		10
12		TARGETS SCORE	SUM LINES 9 THRU 11	11
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	59.40



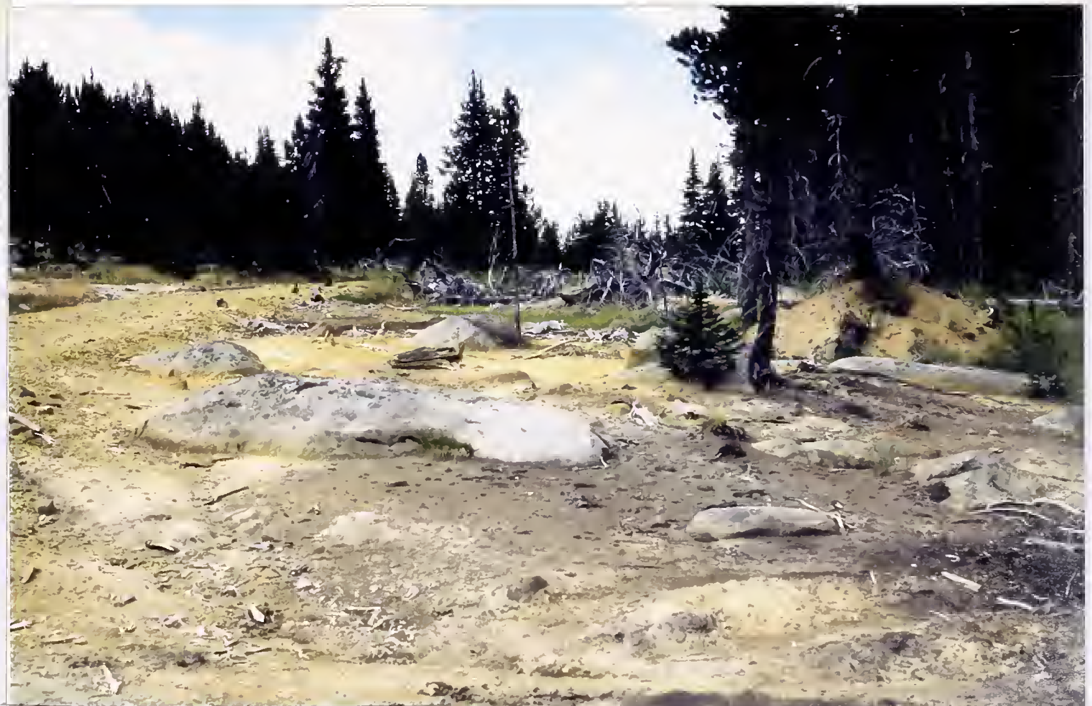
22-106, #9: Mill building



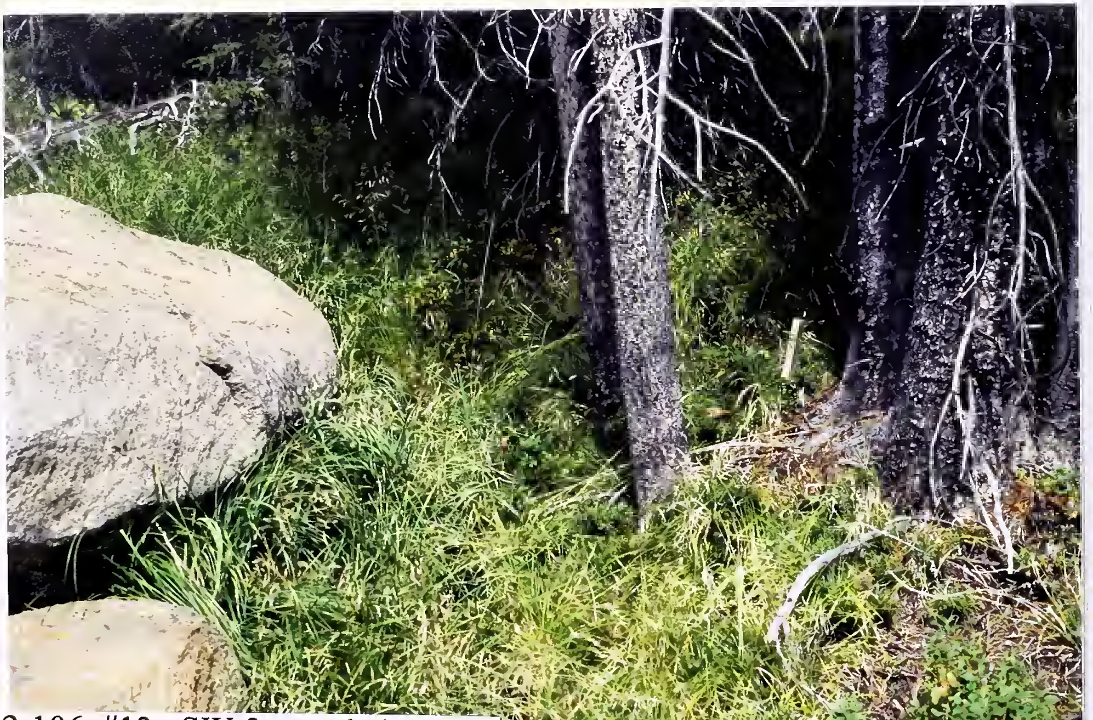
22-106, #10: Southwest side of TP-1

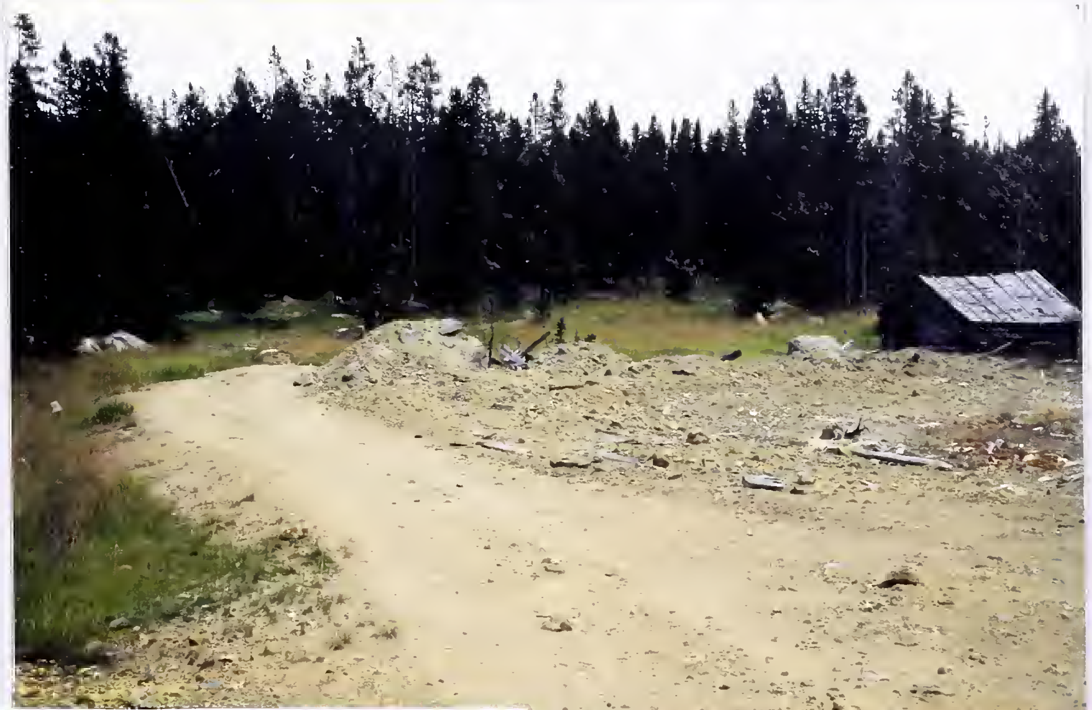


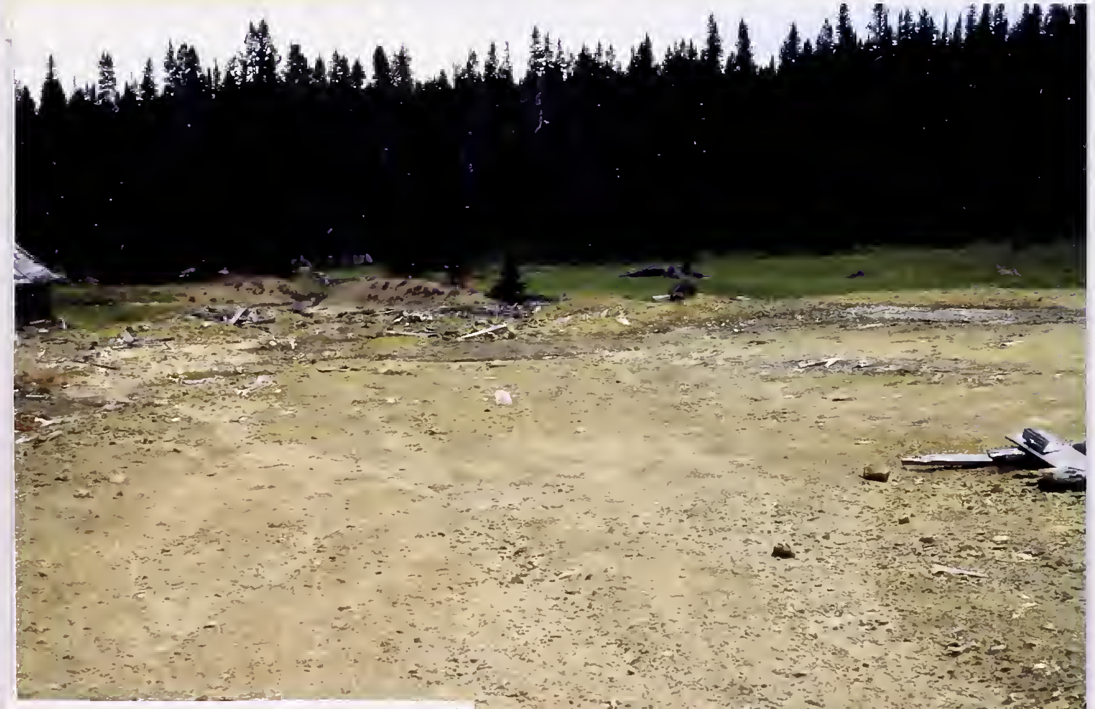
22-106, #11: TP-1 west of road and waste rock road

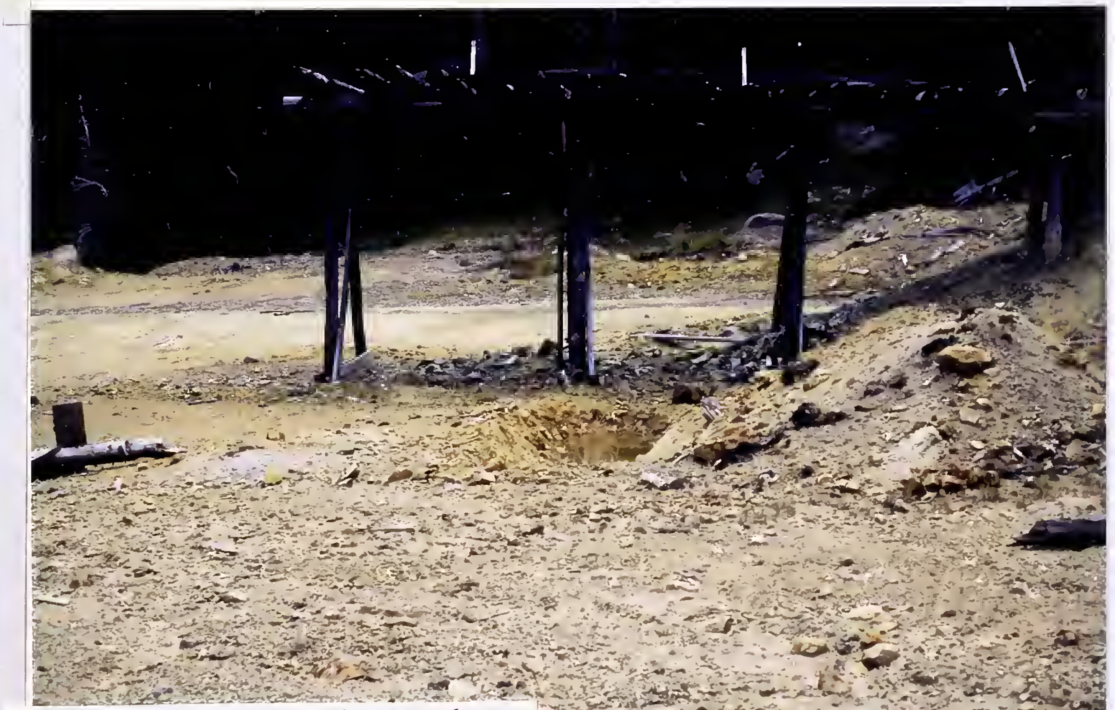


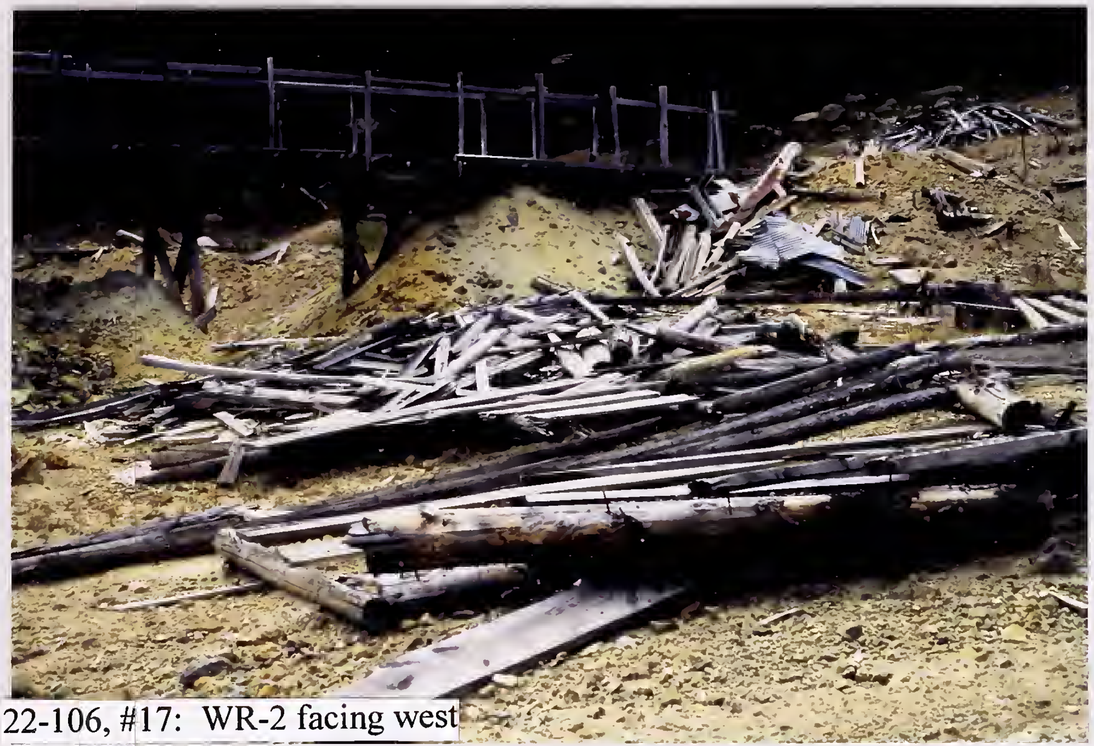
22-106, #12: TP-1 east of road


22-106, #13: SW-3 sample location

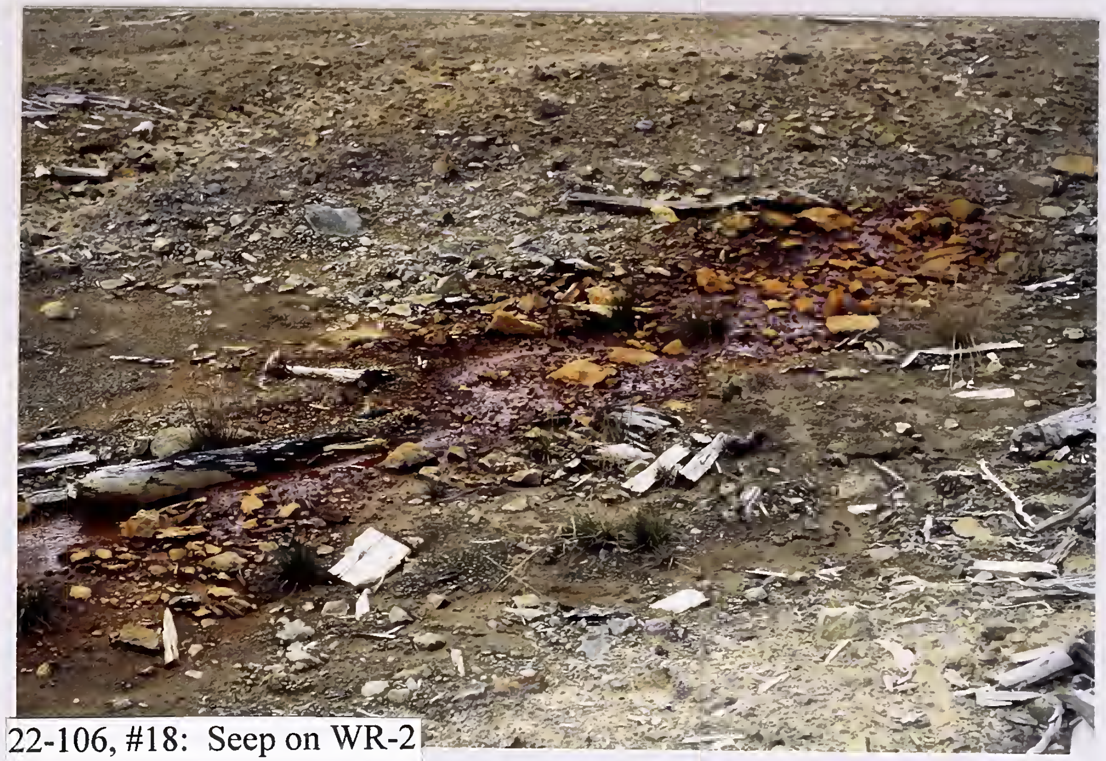

22-106, #14: WR-2 facing southeast


22-106, #15: WR-2 facing south

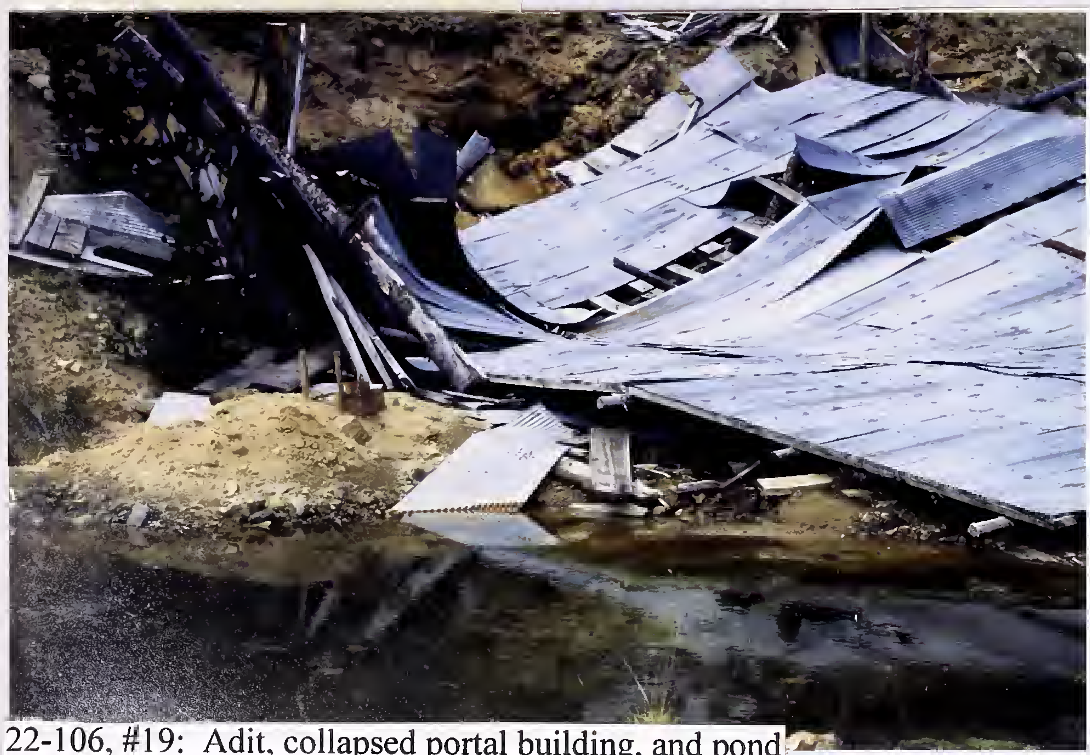

22-106, #16: WR-2 facing southwest



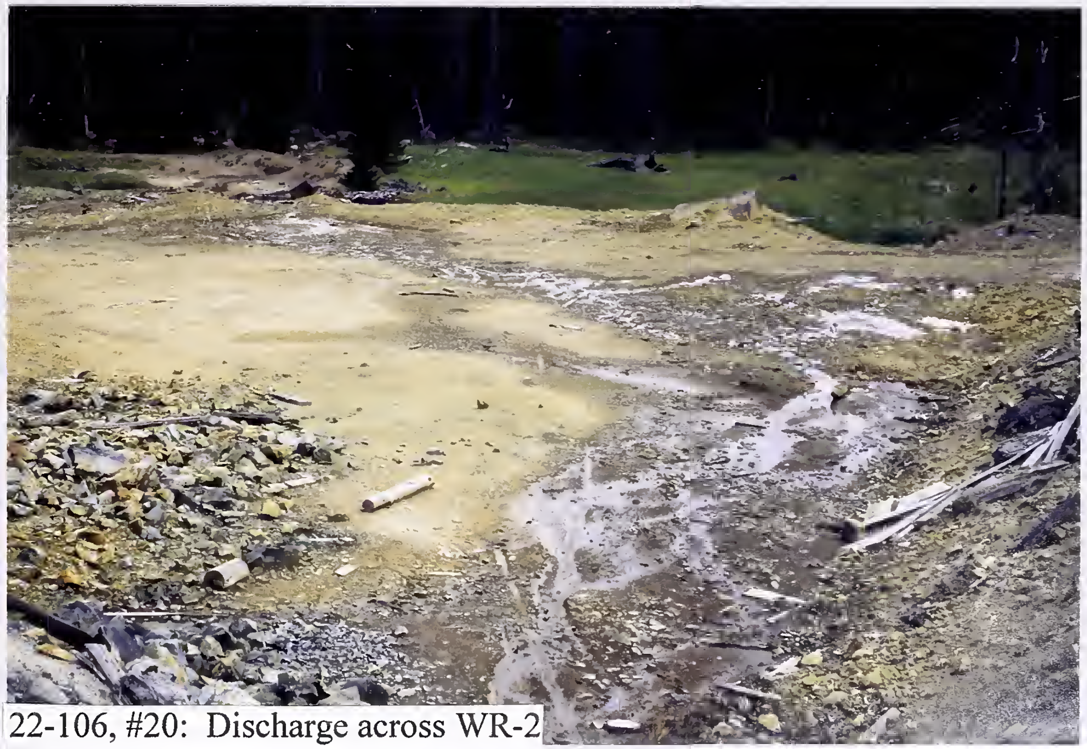
22-106, #17: WR-2 facing west



22-106, #18: Seep on WR-2



22-106, #19: Adit, collapsed portal building, and pond



22-106, #20: Discharge across WR-2

22-106, #21: WR-1 and empty tank

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: BOULDER CHIEF **PA#:** 22-132

Date: June 14, 1994 **Time:** 1030-1405

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Bisch, Clark, West; Pioneer

Visitors: None

Weather/Seasonality Observations: Partly cloudy; cold and windy; intermittent snow; approx. 40°F.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number)**:** #1: SW-1 sample location; #2: SW-2 sample location; #3: SW-3 sample location; #4: TP-1A; #5: TP-1B; #6: TP-1C; #7: WR-3A; #8: WR-3B; #9: Open pit/highwall; #10: Adit #1; #11: WR-2; #12: Downgradient erosion path. Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms)**:** Fence has been damaged by vehicles on west side where road bisects site.

Other Hazardous Materials/Substances Present: One barrel, 3/4 full, labelled "SAE 30 Motor Oil"

General Comments on Potential Remedial Alternatives: Backfill pit with upper dump materials; isolate eroded tailings and WR-2 from drainage. Close HMO.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): BOULDER CHIEF **PA#:** 22-132

Legal Description: **T** 7N **;R** 5W **;Sec.** 27 **,** SW **1/4** NW **1/4** ____ **1/4**

County: JEFFERSON **Mining District:** CATARACT

Latitude: N 46° 19' 48" **Longitude:** W 112° 12' 24"

Primary Drainage Basin and Code: Cataract Creek/10020006
Secondary Drainage Basin: Cataract Creek

USGS Quadrangle map name(s): Mount Thompson

Mine Type/Commodities: Hardrock/Lead, Silver, Copper

Activity Status: **Active** ___, **Inactive/Exploration** ___, **Abandoned** X .

Ownership: Known Y ___ **N** X ; **private/public?** Private
Owner, Agent, or Contact (Include address and phone when available)**:** Unknown

Relationship to other mines/sites in the area/district: Three miles northwest of the Comet mine.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? N/A

General site features: Elevation 7520' , **Slope** 10°-20° ,
Aspect West

Land use: Mining ___, **Recreational** X , **Residential** ___, **Urban** ___,
Agricultural ___, **Other(Specify)** ______

Area of disturbed/unvegetated lands? 2.5 **acre(s).**
Site Dimensions: 750 feet x 175 feet

Predominant vegetation types: Lodgepole pine, Douglas fir, grass

Access: roads - good (paved) ___, **poor (maintained dirt road)** ___,
4wd X , **trail** ___.
Other logistical considerations (proximity to other sites). Near summit of Mount Thompson

Well logs within 1 mile radius; (Attach MBMG Well Log Printout(s): There are no wells reported within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Radioactivity has been reported in small pits east of the shaft. A sample of the most radioactive material, which consisted mostly of brown, iron-stained quartz, contained 0.016% equivalent uranium and 0.010% uranium. Site lies above an unnamed tributary to Cataract Creek. Water leaving the site flows northwest to unnamed tributary and then west to confluence with Cataract Creek approximately one mile away. Cataract Creek flows south to confluence with the Boulder River 4 to 5 miles downstream. The site is underlain by volcanics, which is underlain by quartz monzonite of the Boulder batholith.

Mining/milling history, ore type/tenor, host rock, gangue: Mine was actively worked from 1913 to 1917. Appears from dump material that workings were following vein mineralization. Deposit is in brecciated andesite near contact with quartz monzonite. Sulfide minerals on the dump are galena, sphalerite, pyrite, and arsenopyrite.

Mine Operation?

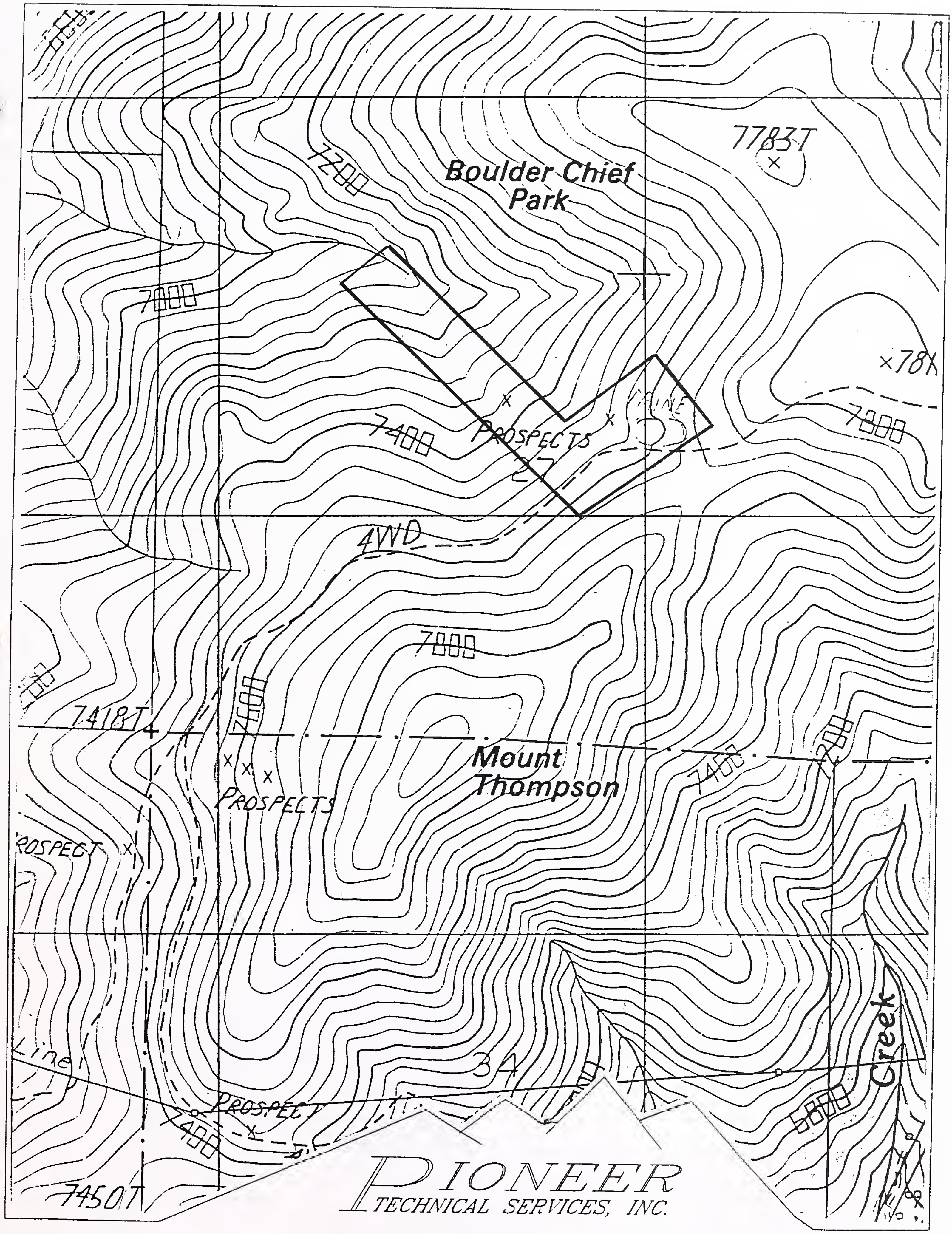
Shafts - **Yes** X, **No** ___, **#** 1, **Comment** Inaccessible (collapsed)
Adits - **Yes** X, **No** ___, **#** 2, **Comment** Gated; discharging
Pits - **Yes** X, **No** ___, **#** 1, **Comment** Fenced
Placers - **Yes** ___, **No** X, **#** ___, **Comment** ___
Other - **Yes** X, **No** ___, **#** 1, **Comment** Highwall (300x100x30)

Mill Operation? **Yes** X, **No** ___. **If yes answer the next three questions:**

Period(s) of Operation: 1913 to 1917

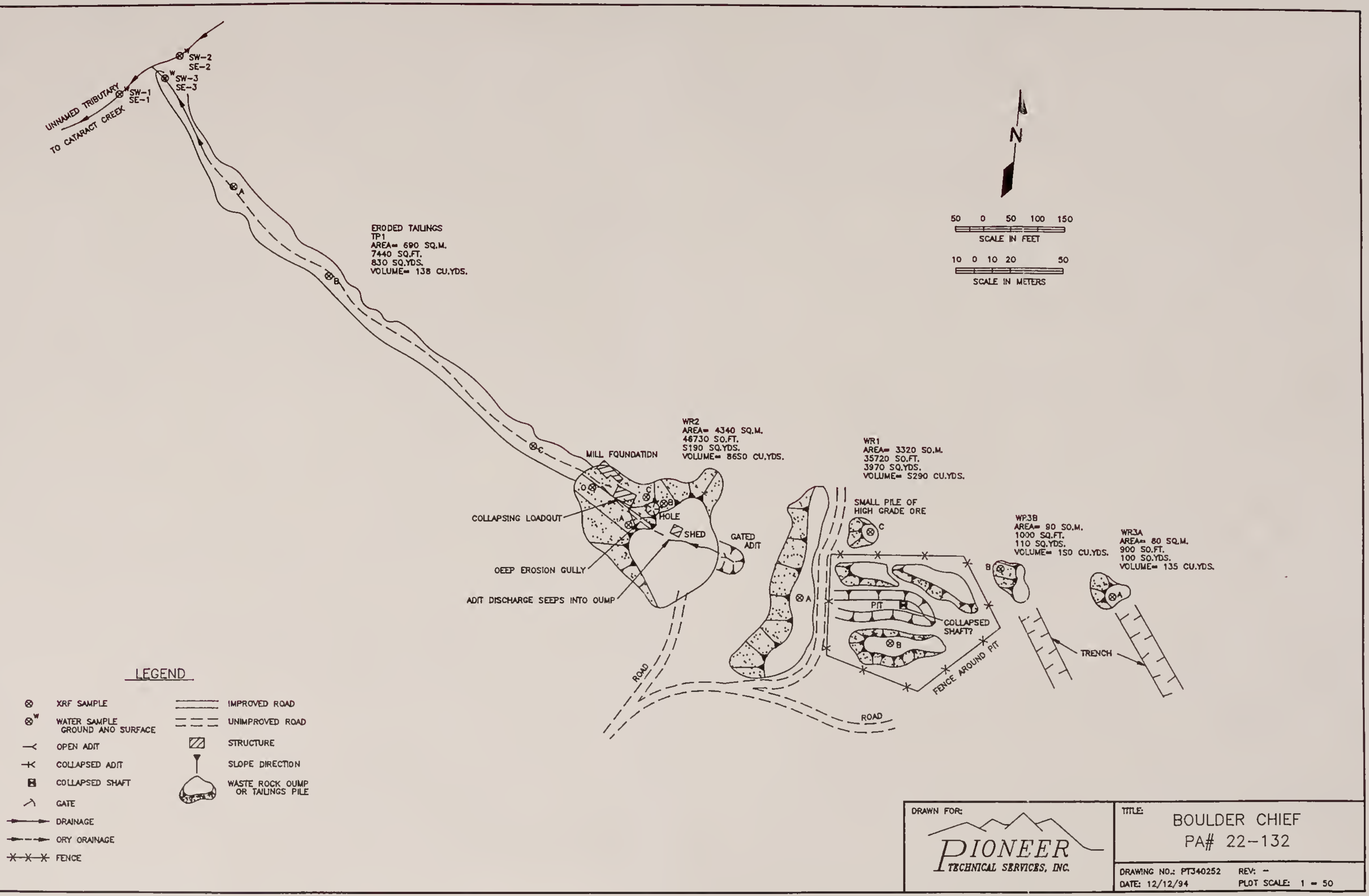
Origin of Ore Milled - Custom Mill ___ **Dedicated Mill** X; **Number and names of mines that supplied mill feed:** ___

Process? Hg-amalgam, CN$^-$ leach (vat, heap), floatation, smelting? Gravity concentrator



PIONEER TECHNICAL SERVICES, INC.

BOULDER CHIEF, P.A. NO. 22-132
T07N, R05W, SECTION 27
SCALE: 1" = 1000'



DRAWN FOR:

PIONEER
TECHNICAL SERVICES, INC.

TITLE:

BOULDER CHIEF
PA# 22-132

DRAWING NO.: PT340252 REV: –
DATE: 12/12/94 PLOT SCALE: 1 = 50

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. **Waste Characteristics** - *Use table on following page.*

Unique source identification: (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures/vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. **TAILINGS IMPOUNDMENTS** - *If tailings impoundments are also present, complete the following questions.*

Describe the tailings grain size distribution (approximate % sand, silt, & clay): Approximately 50% coarse sand and 50% small gravel

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): No impoundment; slurried down hillside with depth ranging from 0 to 4 feet deep.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Moist from precipitation and spring runoff.

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: Excavate and place in repository.

SOURCE INVENTORY FORM

SAMPLERS: Bisch

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd³)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)'	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1A	WR	5,290	Coarse brown/gray material downslope (west) of pit	None	5.8 (D)	0.055	22-132-WR-1	06/14/94 1750	T-Metals, ABA
WR-1B	WR		Coarse brown/gray material on south side of pit	None	6.0 (D)	0.045			
WR-1C	WR		Small dump outside of fenced area (north of fence); coarse gray material	None	3.6 (D)	0.055	N/A	N/A	XRF Analysis
WR-2A	WR	8,650	South side of large lower dump; orange/brown sand	None	< 3.5 (D)	0.07	22-132-WR-2	06/14/94 1800	T-Metals, ABA
WR-2B	WR		North side of dump; brown sand	None	3.8 (D)	0.06			
WR-2C	WR		North side of dump near possible mill building; gray/yellow sand/gravel with noticeable sulphur small	None	5.1 (D)	0.04			
WR-2D	WR		Yellow sand on possible mill foundation; possible tailings, very small volume	None	6.4 (D)	0.04	N/A	N/A	XRF Analysis
WR-3A	WR	135	Uppermost dump; coarse brown material	None	6.5 (D)	0.04	22-132-WR-3	06/14/94 1815	T-Metals, ABA
WR-3B	WR	150	Dump directly above fence; coarse brown	None	5.9 (D)	0.045			
TP-1A	TAIL	140	Tailings deposit in drainage 400' above PPE with tributary; coarse brown sand with gravel 1' deep	None	5.9 (D)	0.05	22-132-TP-1	06/14/94 1830	T-Metals, ABA
TP-1B	TAIL		Tailings 1/2 way between tributary and mine; coarse orange sand with gravel 3' deep	None	6.8 (D)	0.05			
TP-1C	TAIL		Tailings 200' below mill; coarse tan sand 1.5' deep	None	6.9 (D)	0.05			
SS-1	SOIL	N/A	Background soil sample in open park west of site	N/A	N/A	N/A	22-132-SS-1	06/14/94 1430	T-Metals

'D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-132-WR-1 is composite of WR-1A and -1B. 22-132-WR-2 is composite of WR-2A through -2C. 22-132-WR-3 is composite of WR-3A and -3B. 22-132-TP-1 is composite of TP-1A and -1B. A 120'x18' trench with small dump is located above (east) of pit in timber. Radioactivity in uppermost trench and on dump ranged from 0.025 to 0.065. Radioactivity in trench directly above pit and fence ranged from 0.03 to 0.06. Conifers growing on WR-3A.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes_X_, **No**____, **Number:**_1_ **Identification:**_Adit associated with WR-2_

Filled shafts: Yes___, **No**_X_, **Number:**____ **Identification:**____

Seeps/Springs: Yes___, **No**_X_, **Number:**____ **Identification:**____

Groundwater wells within 4 miles?: Yes_X_, **No**___;
Number of well logs:_14_

Distance to nearest well used for drinking:
___**<1,000 ft;**___**1,000 ft to 0.5 miles;**_X_**>0.5 miles.**

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, **Probable**_X_, **Possible**____, **Unlikely**____.
Water is draining through uncontained wastes containing elevated metal values and seeping into the ground. Discharging adit indicates shallow groundwater.

Approximate Depth to Groundwater:_X_**<25 ft;**___ **25 - 100 ft;**___ **>100 ft.**

Other observations/notes: Relatively shallow groundwater (<25') below the site in depositional area. Upper pit has a small volume of standing water.

GROUNDWATER INVENTORY FORM

SAMPLERS: Bisch

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
AD-1	AD	Water seeping from adit assoc. with WR-2 and into dump after 50' of surface expression	0	3.0	497	N/A	4.2	0	N/A	N/A	N/A	Field Parameters

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): AD-1 is standing water and was not sampled for laboratory analysis due to lack of flow.

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No ____, **Name(s):** Unnamed tributary to Cataract Creek is approximately 1/4 mile below the mine.

Dry streambeds: Yes ____, No X, **Name(s):** ____

Other surface water: Yes X, No ____, **Name(s)/Description:** Ponded water in upper pit and numerous seeps surfacing in the drainage below the mine that flow into the unnamed tributary.

Waste materials within any floodplain: Yes X, No ____ **Source ID(s):** Mine waste has washed down into tributary of Cataract Creek and is deposited along the banks.

Approximate Flood frequency? X 1 yr, ____ 10 yr, ____ 100 yr

Estimated seasonal flow of stream(s) (cfs/gpm)? 0.12 cfs
High Flow: 0.5 cfs, **Average Flow:** 0.1 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes X, No ____, **Describe:** Flow from seeps drain through tailings and waste rock that have washed down from the mine, as well as streamside deposits in the tributary.

Surface water use within 15 miles downstream? **(Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)** Nearest wetland is within 200 feet of the site; possible irrigation and fishery.

Observed erosional/sedimentation/stream turbidity problems? Yes X, No ____. **Distance downstream (ft)?** 0-500 ____; 500-1,000 ____; >1,000 X. **Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):** Tailings and waste rock have washed down 1/4 mile to unnamed tributary. XRF analyses of sediments from this tributary report elevated metals concentrations at 1,000 feet from the confluence.

SURFACE WATER INVENTORY FORM

SAMPLERS: Bullock, Bisch

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	Downstream in tributary to Cataract Creek below confluence with mine drainage	5.87	201	4.2	17	0.12 cfs (M)	22-132-SW-1	06/14/94 1115	T-Metals, TDS, Hardness, Cl, SO4, NC2/NO3
SE-1	SE	Downstream in tributary to Cataract Creek below confluence with mine drainage	N/A	N/A	N/A	N/A	N/A	22-132-SE-1	06/14/94 1115	T-Metals
SW-2	SW	Upstream in tributary to Cataract Creek above confluence with mine drainage	6.24	129	4.6	12	--	22-132-SW-2	06/14/94 1125	T-Metals, TDS, Hardness, Cl, SO4, NC2/NO3
SE-2	SE	Upstream in tributary to Cataract Creek above confluence with mine drainage	N/A	N/A	N/A	N/A	N/A	22-132-SE-2	06/14/94 1125	T-Metals
SW-3	SW	PPE of mine drainage with tributary to Cataract Creek	5.80	135	4.8	9	15 gpm (E)	22-132-SW-3	06/14/94 1135	T-Metals, TDS, Hardness, Cl, SO4, NC2/NO3
SE-3	SE	PPE of mine drainage with tributary to Cataract Creek	N/A	N/A	N/A	N/A	N/A	22-132-SE-3	06/14/94 1135	T-Metals
SW-4	SW	Ponded water in pit	8.77	277	14.1	15	N/A	N/A	N/A	Field Parameters
SE-500	SE	500' downstream in unnamed tributary of Cataract Creek	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis
SE-1000	SE	1,000' downstream in unnamed tributary of Cataract Creek	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ______

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	*(SO_3)*
Presence of evaporative salt deposits?	*(ESD)*
Discolored or turbid seepage?	*(SPG)*
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	*(FEOX)*
Presence of burned or stressed vegetation?	*(VEG)*
pH ≤ 5.0	*(pH)*

General Potential for AMD Mitigation:

Area available for treatment (acres)? None

Wetlands present: Yes____, No X , Describe:

Carbonate rocks/soils: Yes____, No X , Describe:

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10____; 10-30 X ; 30-100____; 100-300____; 300-1,000____; 1,000-3,000____; 3,000-10,000____; 10,000 or greater____; Comments

Nearest residence:____<1,000 ft;____1,000 ft - 0.5 miles; X >0.5 miles.

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Bullock, Bisch

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
WR-1	Moderate/low SO3; pH	Moist from precip.	35,720	26,790	No	Low
WR-2	High SO3; pH	Moist from precip.	46,730	46,730	No	Low
WR-3A	Moderate/low SO3	Moist from precip.	900	450	No	Low
WR-3B	Moderate/low SO3	Moist from precip.	1,000	500	No	Low
TP-1	Moderate SO3	Moist from precip.	7,440	,440	No	Low
AD-1	pH	N/A	N/A	N/A	N/A	N/A

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes_____, No_X__,
Describe:________________________________

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___; 300-1,000____; 1,000-3,000____; 3,000-10,000____; 10,000 or greater____;
Comments_ None

Evidence of recreational use on site: Yes_X_, No____, Describe:_ Tire tracks in road; trash; evidence of shooting

Accessibility (check each that apply):___Easily accessible - no fences, gates, or warning signs;_X_Moderately Accessible - barbed wire fences, road gated, or signs posted;____Difficult Access - chain-link fence, road gated and locked, site guarded (does not include locked or manned access points located more than 0.5 miles from the actual site).

Sensitive environments on-site or adjacent to site:
State or National Parks - Yes___, No_X_, Comment________________
Wilderness Area - Yes___, No_X_, Comment________________
T&E Species Habitat - Yes___, No_X_, Comment________________
Bat Habitat - Yes___, No_X_, Comment________________

Primary Drainage___; Secondary Drainage___; No Information___:
Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium___, Low_X_
Fisheries Habitat and Species Classification - _4_
Sport Fishery Classification - _4_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, No___, Number_2__, types and locations:___ One open pit (fenced); one gated adit

Hazardous structures: Yes_X_, No___, Number_2__, types and locations:_ Mill structures located on WR-2

Unstable highwalls, pits, trenches, slopes: Yes_X_, No___, Number_1__, types and locations:_ Open pit with large blocks of bedrock collapsing

Unstable waste piles, impoundments, undercut banks: Yes_X_, No____, Number_1__, types and locations:_ WR-2 has extremely steep slopes.

Fire and/or Explosion hazards: Yes___, No_X_, Explain:________________

Bibliography

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MBMG, Well Log Database, July 14, 1994.

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USGS, Geology and Mineral Deposits of the Jefferson City Quadrangle, Jefferson and Lewis and Clark Counties, Montana, Professional Paper 428, Author Unknown, Date Unknown.

USGS, Topographic Map, Mount Thompson, Montana, 7 1/2 minute Quadrangle, 1985.

LABORATORY ANALYTICAL DATA

BOULDER CHIEF
PA NO. 22-132

Boulder Chief PA# 22-132
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BULLOCK
INVESTIGATION DATE: 06/14/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-132-SE1	0.6 U	7.0	45.6	9.1 J	5.1	5.2	17.6	8500	0.03 U	396	7.9	156	6.4 UJ	1140	NR
22-132-SE2	0.7 U	11.3	93.7	0.9 J	7.8	8.2	22.2	13000	0.05 J	709	11.9	16.3	7.3 UJ	45.8	NR
22-132-SE3	24.2	37.8	44.5	69.4 J	5.6	3.0	71.1	8780	0.06 J	1830	4.9	2130	27.7 J	9420	NR
22-132-TP1	76	186	8.5	170 J	1.3 U	0.7 U	302	9300	0.53 J	51	1.5	24300	105 J	23700	NR
22-132-WR1	4.9	10.9	113	13.6 J	9.8	1.0 U	27.2	29700	0.07 J	10100	5.3	364	6.0 UJ	883	NR
22-132-WR2	17.8	26.7	90.2	9.5 J	2.7	2.5	158	13300	0.83 J	556	5.8	7680	5.1 UJ	1060	NR
22-132-WR3	3.2	19.8	126	0.6 J	2.3	2.2	31.4	12600	0.06 J	239	2.4	723	4.5 UJ	30.2	NR
BACKGROUND	0.6 U	23.1	178	2.0 J	9.7	3.9	23.1	13600	0.04 J	1280	3.4	42.3	6.4 UJ	120	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-132-TP1	3.67	115	-5.14	-120	0.42	1.06	2.19	33.1	-38.3
22-132-WR1	0.04	1.25	3.44	2.19	0.04	<0.01	<0.01	0.00	3.44
22-132-WR2	0.51	15.9	3.66	-12	0.30	0.03	0.18	0.94	2.73
22-132-WR3	0.06	1.87	-0.04	-1.9	0.05	0.01	<0.01	0.31	-0.35

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-132-SW1	0.12 U	3.5	9.9	5.1	8.7 U	5.5	4.6 U	200	0.11 U	7.1	8.0 U	21.9	29.4 U	806	28.9
22-132-SW2	0.12 U	4.0	10.6	2.6 U	8.7 U	4.7 U	4.6 U	151	0.11 U	6.4	8.0 U	1.9	29.4 U	4.5 U	24.2
22-132-SW3	2.15	5.6	10.4	35.1	8.7 U	4.7 U	8.7	479	0.11 U	40.7	8.0 U	289	29.4 U	6300	33.5

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-132-SW1	91	<5	15	<0.05	NR
22-132-SW2	82	<5	8.0	<0.05	NR
22-132-SW3	121	<5	40	<0.05	NR

LEGEND

SE1 - Downstream in tributary to Cataract Crk. below confluence with mine drainage.	BACKGROUND - From the Boulder Chief Mine (22-132-SS1).
SE2 - Upstream in tributary to Cataract Crk. above confluence with mine drainage.	SW1 - Same as sample 22-132-SE1.
SE3 - PPE of mine drainage with tributary to Cataract Creek.	SW2 - Same as sample 22-132-SE2.
TP1 - Composite of subsamples TP1A and 1B.	SW3 - Same as sample 22-132-SE3.
WR1 - Composite of subsamples WR1A and 1B.	
WR2 - Composite of subsamples WR2A, 2B, and 2C.	
WR3 - Composite of subsamples WR3A and 3B.	

XRF ANALYSIS RESULTS

BOULDER CHIEF
PA NO. 22-132

Mine Name: Boulder Chief PA# 22-132
XRF Field Analyses
Results in PPM

XRF SAMPLE I.D.	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Ni	Cu	Zn	As	Sr
22-132-SE1000		14040.6	5740.2	1677.36		2357.95	16755.3			85.0608 *	1936.82		196.239
22-132-SE500		19204.7	6637.14	2306.52		1833.39 *	16652.5				2731.92		232.116
22-132-TP1A		6619.09	1193.88	196.708 *		556.713 *	23365.9			360.694 *	17225.5		
22-132-TP1B		7353.41	1196.2	379.847 *	246.449 *	550.53 *	13713.1			324.42 *	6792.98		
22-132-TP1C		8614.41	1316.14	439.251 *		933.922 *	15107.4			652.897	5917.88		
22-132-TP1-COMP		7295.23	1343.53	304.539 *		522.982 *	16779.9			436.834	10807.4		
22-132-WR1A		26833.3	5169.23	2020.72		6011.47	26869.9				645.679		129.099
22-132-WR1B		37845.9	5130.89	2674.13		799.656 *	20517				145.883 *		200.075
22-132-WR1C		28208	3211.07	1565.35	243.651 *	480.067 *	12277.3			261.037 *	2177.13		85.844
22-132-WR1-COMP		27433.2	5487.55	2024.47		2488.26	20585.7				359.434		141.162
22-132-WR2A		22954.3	1983.05	924.723	199.751 *	744.518 *	27096.6			367.972	3066.07		41.7755 *
22-132-WR2B	818.114 *	19393.9	10959.4	1707.55		2553	22774.7		147.414 *	110.801 *	177.786		191.682
22-132-WR2C		18768.1	1362.27	823.116		1130.64 *	15949.7			284.473 *	786.946		11.4726 *
22-132-WR2D		8406.65	1259.18	319.118 *		958.723 *	13358.6			460.632	13694.8		
22-132-WR2-COMP		16950 $	5610 $	1118 $	186 $	940 $	22450 $			170 $	1252 $		94.3 $
22-132-WR3A	1337.14 *	34716.6	2185.54	1543.91		1475.08 *	17957.3			74.1104 *	118.093 *		92.8529
22-132-WR3B		24109.7	4622.08	2256.99		876.081 *	20722.6				78.8882 *		162.767
22-132-WR3-COMP		25760.3	3780.08	1943.98		1177.13 *	19003.2				112.617 *		128.791

XRF SAMPLE I.D.	Zr	Hg	Mo	Pb	Rb	Cd	Sn	Sb	Ba	Ag	U	Th
22-132-SE1000	159.602			1196.46	149.923				387.449			16.9633 *
22-132-SE500	215.939			971.017	180.758				525.15	87.8008 *		19.3539 *
22-132-TP1A	52.8961		17.7676 *	10739.2	84.3809 *			168.734 *		131.965 *		42.9663 *
22-132-TP1B	65.691		10.5367 *	7671.48	59.1582 *			118.689 *		109.436 *		
22-132-TP1C	43.7124 *		21.1619 *	11035	89.6007	197.119 *		138.539 *				69.0732 *
22-132-TP1-COMP	49.7237		12.1843 *	9856.83	56.4581 *			131.184 *		134.415 *		
22-132-WR1A	331.851			527.809	227.598			64.1866 *	920.605			
22-132-WR1B	342.776			268.074	244.913				1190.02		24.2069 *	
22-132-WR1C	258.89		9.76262 *	1049.82	236.917			231.383	502.935			
22-132-WR1-COMP	285.416		9.54478 *	411.982	204.258				857.383			14.1831 *
22-132-WR2A	165.069		16.0085 *	3284.3	187.006				150.124			36.3266 *
22-132-WR2B	224.343		11.5064 *	67.6647 *	131.541				730.2		23.6762 *	33.1472 *
22-132-WR2C	111.479		15.2654 *	5811.32	144.387				32.9517 *			54.2715 *
22-132-WR2D	63.1731		14.5062 *	8186	90.9274	154.5 *		141.987 *				41.1968 *
22-132-WR2-COMP	166.5 $		14.9 $	3635 $	148.6 $			33 $	281 $	31 $		23.9 $
22-132-WR3A	208.533		9.67867 *	240.156	251.265				668.527			27.34 *
22-132-WR3B	231.353			343.333	182.233				686.707			21.8338 *
22-132-WR3-COMP	189.88			361.685	196.403				610.949			23.4123 *

* = Estimated Quantity

$ = Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

BOULDER CHIEF
PA NO. 22-132

AIMSS SCORESHEET

SITE NAME: Boulder Chief
PA NUMBER: 22-132

LINE NO.				
		GROUNDWATER PATHWAY		
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	26.494
6		WELLS - 1 MI. x 2.5		0.0
7	GW - TARGETS	WELLS - 1 TO 4 MI		14
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	14.0
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	148366
		SURFACE WATER PATHWAY		
11		OBSERVED RELEASE		300
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		100
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	800
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	29.273
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		1
18		WETLANDS		10
19	SW - TARGETS	FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	19
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	444950
		AIR PATHWAY		
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		5
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	25
27		LIKELIHOOD SCORE	LINES 25 + 26C	25
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.156
29		POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31	AIR - TARGETS	WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	10
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	289
		DIRECT CONTACT PATHWAY		
36		OBSERVED EXPOSURE		50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		10
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	50
38		LIKELIHOOD SCORE	LINES 36 + 37C	100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.046
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		0
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		5
43		TARGETS SCORE	SUM LINES 40 THRU 42	5
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	523
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE	(LINES 10 + 24 + 35 + 44) / 100,000		5.94

SITE NAME: Boulder Chief
PA NUMBER: 22-132

SITE SAFETY

LINE NO.				
1	THREAT	ACCESSIBILITY		10
2		OPEN SHAFTS	100 EA.	100
3		OPEN ADITS	50 EA.	50
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	75
5		HAZ. STRUCTURES	40 EA.	80
6		EXPLOSIVES		100
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	405
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		5
12		TARGETS SCORE	SUM LINES 9 THRU 11	5
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	20.25

SUMMARY OF HISTORICAL ANALYTICAL DATA FROM OTHER SOURCES

From Ted Duaime, MB

LAB ID	SAMPLE ID	ANALYSIS	Cr	c	q	Ni	c		Cu	c	q	Zn	c	q	As	c	q	Ag	c	q	Cd	[illegible]	q	Ba	c	q
Lady Leith Mine																										
92Q358	BLLS10L	DISS. METALS	0.00	U		0.00	U		0.00	U		5.69	B		3.81	B		0.00	U		0.00	U		6.66	B	
92Q362	BLLS20H	DISS. METALS	0.00	U		8.82	B		37.08	B		1282.00			2.08	B		0.00	U		14.42			16.13	B	
92Q359	BLLS30L	DISS. METALS	0.00	U		0.00	U		0.00	B		37.17	B		5.10	B		0.00	U		0.00	U		9.65	B	
92Q360	BLLS40H	DISS. METALS	0.00	U		1.43	U		0.00	U		312.62			10.80	B		0.00	U		0.00	U		6.35	B	
92Q361	BLLS50L	DISS. METALS	0.00	U		0.00	U		0.00	U		32.95	B		4.60	B		0.00	U		0.00	U		8.01	B	
92Q1140	BLLS10L	TR METALS	0.00	U		0.00	U		0.00	U		7.12	B		5.19	B		0.00	U		0.00	U		7.63	B	
92Q1141	BLLS30L	TR METALS	0.00	U		0.00	U		0.00	U		24.25	B		8.50	B		0.00	U		0.00	U		7.33	B	
92Q1142	BLLS40H	TR METALS	0.00	U		7.86	B		0.00	U		47.01			12.05	B		0.00	U		0.00	U		9.24	B	
92S364	BLLD10H	TOTAL METALS	4.42	B	N	4.30	B	N	20.78	B	N	190.09			264.71			3.02	B	N	1.49	B	N	47.78	B	N
92S363	BLLD20H	TOTAL METALS	1.33	B	N	5.18	B	N	76.68		N	729.80			3148.00			18.14	B	N	4.27	B	N	29.73	B	N
92S365	BLLD30H	TOTAL METALS	8.91	B	N	4.01	B	N	294.94		N	628.49			356.01			0.00	U	N	9.91	B	N	77.84	B	N
Ada Mine																										
92Q684	CADS20L	DISS. METALS	0.00	U		0.00	U		0.00	U		0.00	U		1.45	B		0.00	U		0.00	U		8.36	B	
92Q687	CADS30L	DISS. METALS	1.78	B		0.00	U		2.75	B		0.00	U		1.67	B		0.00	U		0.00	U		9.86	B	
92Q688	CADS40L	DISS. METALS	0.00	U		0.00	U		21.56	B		527.77			62.82			0.00	U		4.31	B		1.14	B	
92Q686	CADS50L	DISS. METALS	0.00	U		0.00	U		159.40			189.81			0.70	B		0.00	U		1.70	B		7.84	B	
92Q685	CADS60H	DISS. METALS	1.35	B		41.44	B		4127.00			6160.00			1555.00			1.14	B		50.29			10.51	B	
92S692	CADD10H	TOTAL METALS	3.05	B		1.98	B		123.30		N	108.89		N	2953.49			3.29	B		0.00	U		65.55	B	
92S693	CADD20H	TOTAL METALS	3.22	B		1.81	B		61.97		N	101.58		N	2260.94			0.00	U		0.00	U		72.24	B	
Boulder Chief Mine																										
92Q569	CBCS10H	DISS. METALS	2.19	B		13.84	B		4506.00			18540.00			1.59	B		3.84	B		1137.00			21.99	B	
92Q570	CBCS20H	DISS. METALS	0.00	U		0.00	U		18.37	B		1410.00			0.89	B		0.00	U		11.14			5.96	B	
92Q956	CBCS20H	TR METALS	0.00	U		0.00	U		48.85	B		1590.00			21.93			11.54	B		56.84			14.94	B	
92S572	CBCD11H	TOTAL METALS	3.72	B		3.24	B		188.13			4402.52			38.81			37.96			36.42		N	39.63	B	
Ida M Mine																										
92Q656	CIMS10H	DISS. METALS	0.00	U		35.62	B		95.08			18090.00			2.20	B		0.00	U		156.86			34.09	B	
92Q571	CIMS20H	DISS. METALS	0.00	U		17.29	B		164.50			5267.00			0.00	U		0.00	U		93.44			35.43	B	
92Q962	CIMS10H	TR METALS	0.00	U		34.18	B		86.32			24700.00			2.05	B		0.00	U		130.58			29.67	B	
92Q957	CIMS20H	TR METALS	0.00	U		18.35	B		203.25			6404.00			20.21			6.56	B		97.23			61.30	B	
Rocker Mine																										
92Q689	CROS10H	DISS. METALS	0.00	U		30.47	B		851.40			2453.00			2.48	B		0.00	U		19.89			30.77	B	
92S691	CROD10L	TOTAL METALS	4.97	B		4.11	B		114.51		N	90.83		N	1016.73			1.38	B		0.00	U		64.77	B	
92S690	CROD20H	TOTAL METALS	4.73	B		4.34	B		162.11		N	110.85		N	691.39			0.00	U		0.34	B		42.89	B	

SUBJECT TO REVIEW

SUBJECT TO REVIEW

LAB ID	SAMPLE ID	ANALYSIS	Pb	c	q	Hg	c	q
Lady Leith Mine								
92Q358	BLLS10L	DISS. METALS	0.54	B		0.00	U	
92Q362	BLLS20H	DISS. METALS	218.24			0.00	U	
92Q359	BLLS30L	DISS. METALS	1.08	B		0.06	B	
92Q360	BLLS40H	DISS. METALS	0.00	U		0.00	U	
92Q361	BLLS50L	DISS. METALS	3.19	B		0.00	U	
92Q1140	BLLS10L	TR METALS	0.87	B		0.30		
92Q1141	BLLS30L	TR METALS	6.05			0.10	B	
92Q1142	BLLS40H	TR METALS	7.32			0.09	B	
92S364	BLLD10H	TOTAL METALS	315.73			0.54		
92S363	BLLD20H	TOTAL METALS	2404.00			0.63		
92S365	BLLD30H	TOTAL METALS	166.31			0.65		
Ada Mine								
92Q684	CADS20L	DISS. METALS	0.00	U		0.12	B	
92Q687	CADS30L	DISS. METALS	0.00	U		0.17	B	
92Q688	CADS40L	DISS. METALS	0.00	U		0.12	B	
92Q686	CADS50L	DISS. METALS	0.00	U		0.11	B	
92Q685	CADS60H	DISS. METALS	125.00			0.42		
92S692	CADD10H	TOTAL METALS	154.27			0.71		
92S693	CADD20H	TOTAL METALS	153.05			0.52		
Boulder Chief Mine								
92Q569	CBCS10H	DISS. METALS	36.16			0.23		
92Q570	CBCS20H	DISS. METALS	61.81			0.12		
92Q956	CBCS20H	TR METALS	1654.19			0.21		
92S572	CBCD11H	TOTAL METALS	3258.88			1.66		
Ida M Mine								
92Q656	CIMS10H	DISS. METALS	244.59			0.13		
92Q571	CIMS20H	DISS. METALS	80.30			0.06	B	
92Q962	CIMS10H	TR METALS	212.86			0.22		
92Q957	CIMS20H	TR METALS	1602.24			0.07	B	
Rocker Mine								
92Q669	CROS10H	DISS. METALS	15.33			0.27		
92S691	CROD10L	TOTAL METALS	356.61			0.57		
92S690	CROD20H	TOTAL METALS	99.06			0.82		

SUBJECT TO REVIEW

SUBJECT TO REVIEW

LabID's with 92Q are water
" " " 92S are soil

SUBJECT TO REVIEW

MBMG/Deerlodge National Forest
Abandoned Mine Assay Results

ID	#	Location	Description	Au	Ag	Cu	Pb	Zn
JJNA	1	North Ada, Jefferson Co. Trench	Composite mixture of overburden and old mine dumps stirred together.	0.008	0.600	0.230	0.370	0.070
JAJS	1	North Ada, Jefferson Co. Dump	Vein material selected. Sulfide-rich (up to 40%) py-sph-gal-cor, qtz-sid	0.076	8.580	0.810	2.850	2.480
JJRO	1	Rocker Mine, Jefferson Co. Dump	Select of vein, Vuggy-Qtz-py-sph-tef-cpy-gal-aspy-tovr	0.092	6.670	0.440	1.620	1.600
JJRO	2	Rocker Mine, Jefferson Co. Dump	Composite Ox-unox-Kqm-clt-to-qtz-gal-sen-py	0.110	1.460	0.069	0.730	0.041
JJLL	1	Lady Leith, Jefferson Co., Main Dumps	Select of vein; Li-sulfide (py, ab gal)	0.182	11.400	0.420	3.100	0.200
JJBC	1	Boulder Chief, Jefferson Co., Dump	Composite of main dump. Wallrock (Kvl alt to qtz-ser-py) same vein -qtz-chal-10%py	0.010	1.140	0.019	0.470	0.190
JJBC	2	Boulder Chief, Jefferson Co., Tailings	Composite of tailings- very coarse wallrock (alt) & qtz vein	0.018	4.340	0.055	2.320	3.870
JJAD	1	Ada, Jefferson Co., Dump.	Composite, Qtz-py vn, qtz-ser-py Kgm, & Fe-op st Kgm. both ox & unox.	0.004	3.750	0.057	0.320	0.005
JJAD	2	Ada, Jefferson Co., Dump	Chip Channel-5' width across vein (50%) & ox-alf Kgm. Poddy veins; 18" max width Qtz-py-sph-gal-tert(?).	0.024	1.540	0.060	0.190	0.110

22-132, #1: SW-1 sample location

22-132, #2: SW-2 sample location

22-132, #3: SW-3 sample location

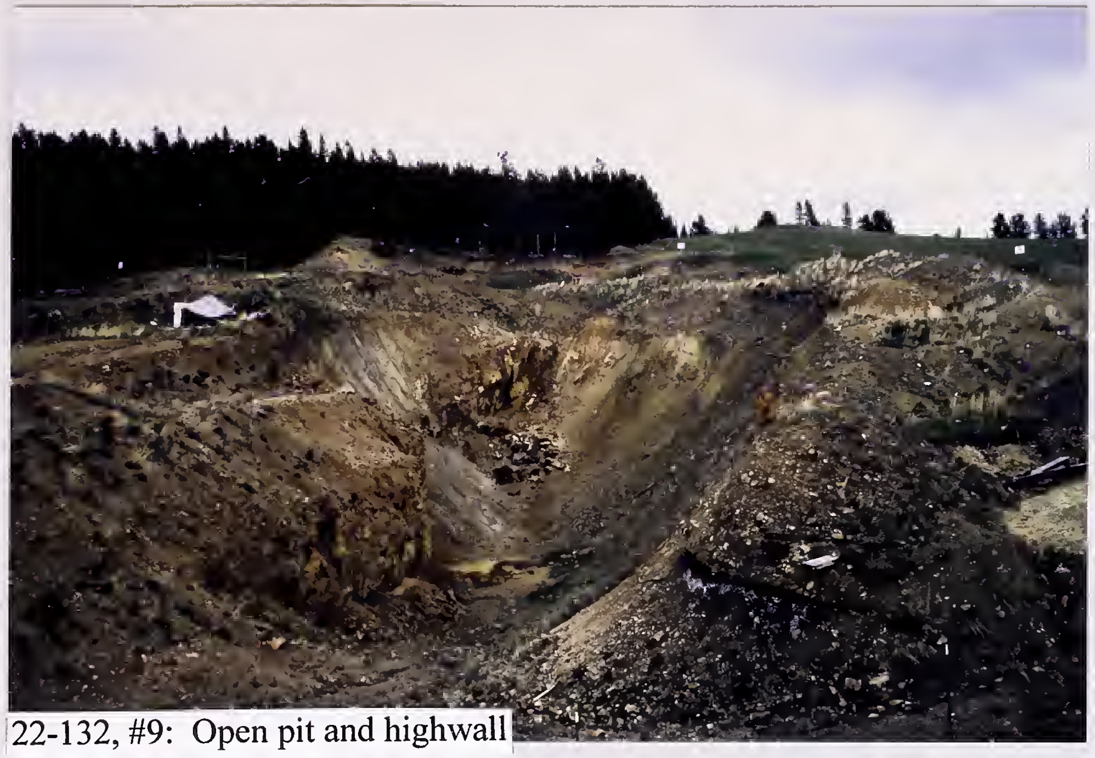
22-132, #4: TP-1A

22-132, #5: TP-1B

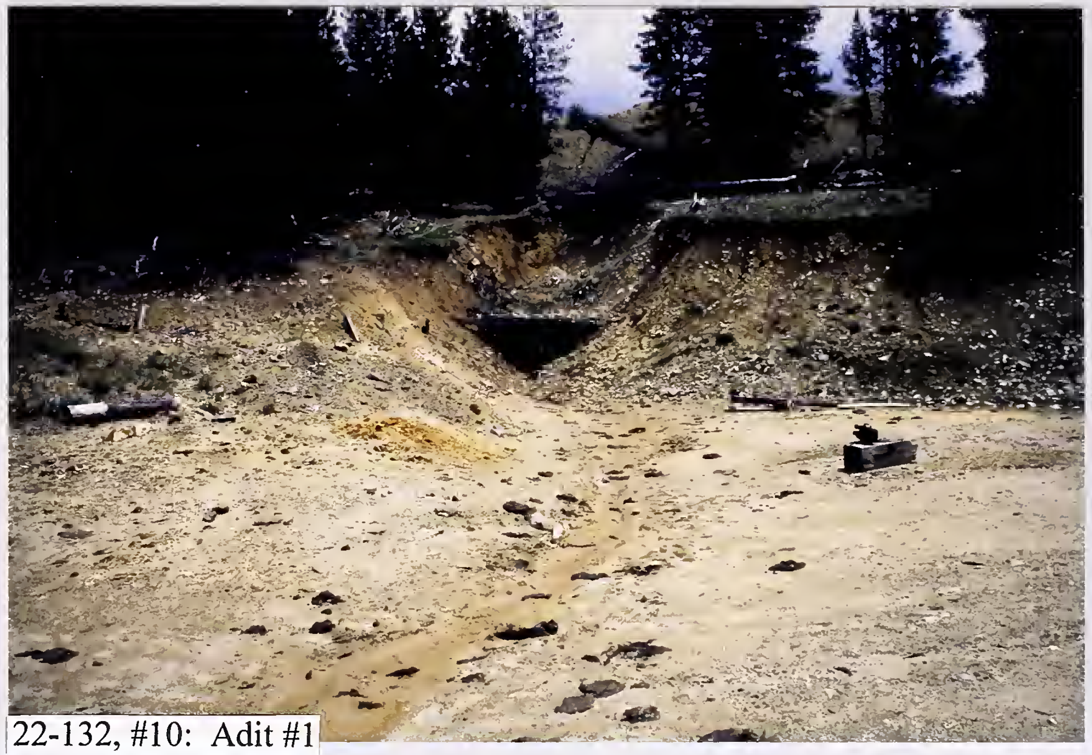
22-132, #6: TP-1C

22-132, #7: WR-3A

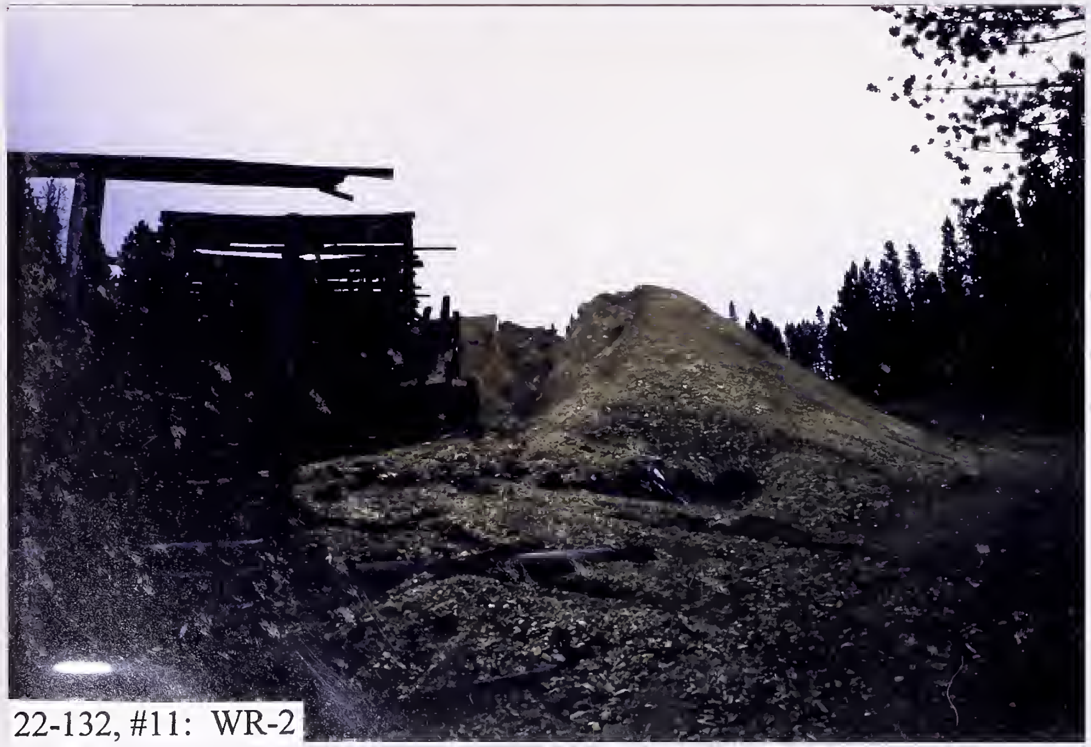
22-132, #8: WR-3B



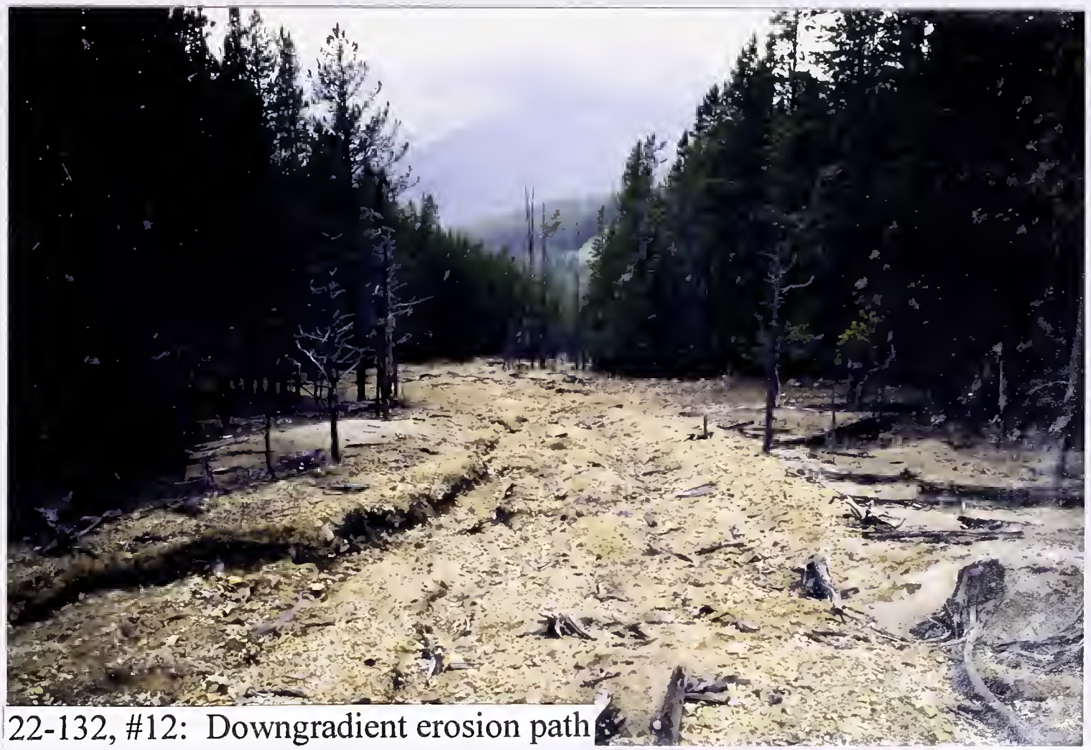
22-132, #9: Open pit and highwall



22-132, #10: Adit #1



22-132, #11: WR-2



22-132, #12: Downgradient erosion path

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: ROCKER/ADA **PA#:** 22-170

Date: June 16, 1994 **Time:** 1200-1800

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Bisch, Clark, West; Pioneer

Visitors: None

Weather/Seasonality Observations: Cloudy; foggy and cold (approx. 45°F); intermittent snow (3" of snow on the ground).

Photographic Log **(Film Roll and Photo No.'s/Video Tape Number):** #1: Adit #5; #2: WR-10 and associated cabin; #3: SW-1 sample location, downstream; #23: WR-1, Shaft #1, and headframe; #24: Shaft #1; #25: WR-2; #26: WR-3; #27: WR-4; #29: WR-6; #30: Adit #1 discharge; #32: Adit #2 discharge; #33: WR-7; #34: Adit #3 and WR-8; #36: Adit #4; #37: WR-9. Video Tape No. 1

General Comments/Observations **(not covered specifically in attached Inventory Forms):** No vehicular access to Rocker or Ada sites; approximately 1/4 mile hike from cabin at end of road along walking trail to the Ada site. Rocer adit is 1,640' from loadout at WR-6 (Ada site) along the trail marked on the topographic map.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Remove dumps from Rocker Creek floodplain, consolidate, recontour, amend, and revegetate.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): ROCKER/ADA **PA#:** 22-170

Legal Description: **T** 7N **;R** 5W **;Sec.** 17 **,** SW **1/4** NE **1/4** ____ **1/4**

County: JEFFERSON **Mining District:** CATARACT

Latitude: N 46° 21' 52" **Longitude:** W 112° 14' 48"
Latitude: N 46° 21' 44" **Longitude:** W 112° 15' 12"

Primary Drainage Basin and Code: Cataract Creek/10020006
Secondary Drainage Basin: Rocker Creek

USGS Quadrangle map name(s): Basin/Mount Thompson

Mine Type/Commodities: Hardrock/Gold, Silver, Lead

Activity Status: Active ___ **,Inactive/Exploration** ___ **,Abandoned** X **.**

Ownership: Known Y ___ **N** X **; private/public?** Private/Public
Owner, Agent, or Contact **(Include address and phone when available):**

Relationship to other mines/sites in the area/district: Rocker mine is located approximately 1,800' downstream from the Ada mine.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? N/A

General site features: Elevation 7200'-7600'**, Slope** 10°-20°**,**
Aspect Southeast

Land use: Mining ___**, Recreational** X**, Residential** ___**, Urban** ___**,**
Agricultural ___**, Other(Specify)**

Area of disturbed/unvegetated lands? 1.2 **acre(s).**
Site Dimensions: 2,000 feet x 300 feet

Predominant vegetation types: Lodgepole pine, Douglas fir

Access: roads - good (paved) ___**,poor (maintained dirt road)** ___**,**
4wd ___**,trail** X**.**
Other logistical considerations (proximity to other sites). Rocker site is 1/2 mile downstream (Rocker Creek) from Ada site.

Well logs within 1 mile radius; (Attach MBMG Well Log Printout(s)): There are no wells reported within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Sites lie on north side of Rocker Creek, which flows northeast away from the sites. Rocker Creek flows into Cataract Creek approximately 1 mile downstream. Cataract Creek flows south to confluence with the Boulder River 8 miles away.

Mining/milling history, ore type/tenor, host rock, gangue: Sites were actively mined from 1900 to 1902. Minerals present at both sites are arsenopyrite, chalcopyrite, galena, pyrite, limonite, sphalerite, and tetrahedrite.

Mine Operation?

Shafts - **Yes** X, **No** ___, **#** 1, **Comment** At Ada site (collapsed)

Adits - **Yes** X, **No** ___, **#** 9, **Comment** 1 caved at Rocker; rest caved at Ada

Pits - **Yes** ___, **No** X, **#** ___, **Comment** ___

Placers - **Yes** ___, **No** X, **#** ___, **Comment** ___

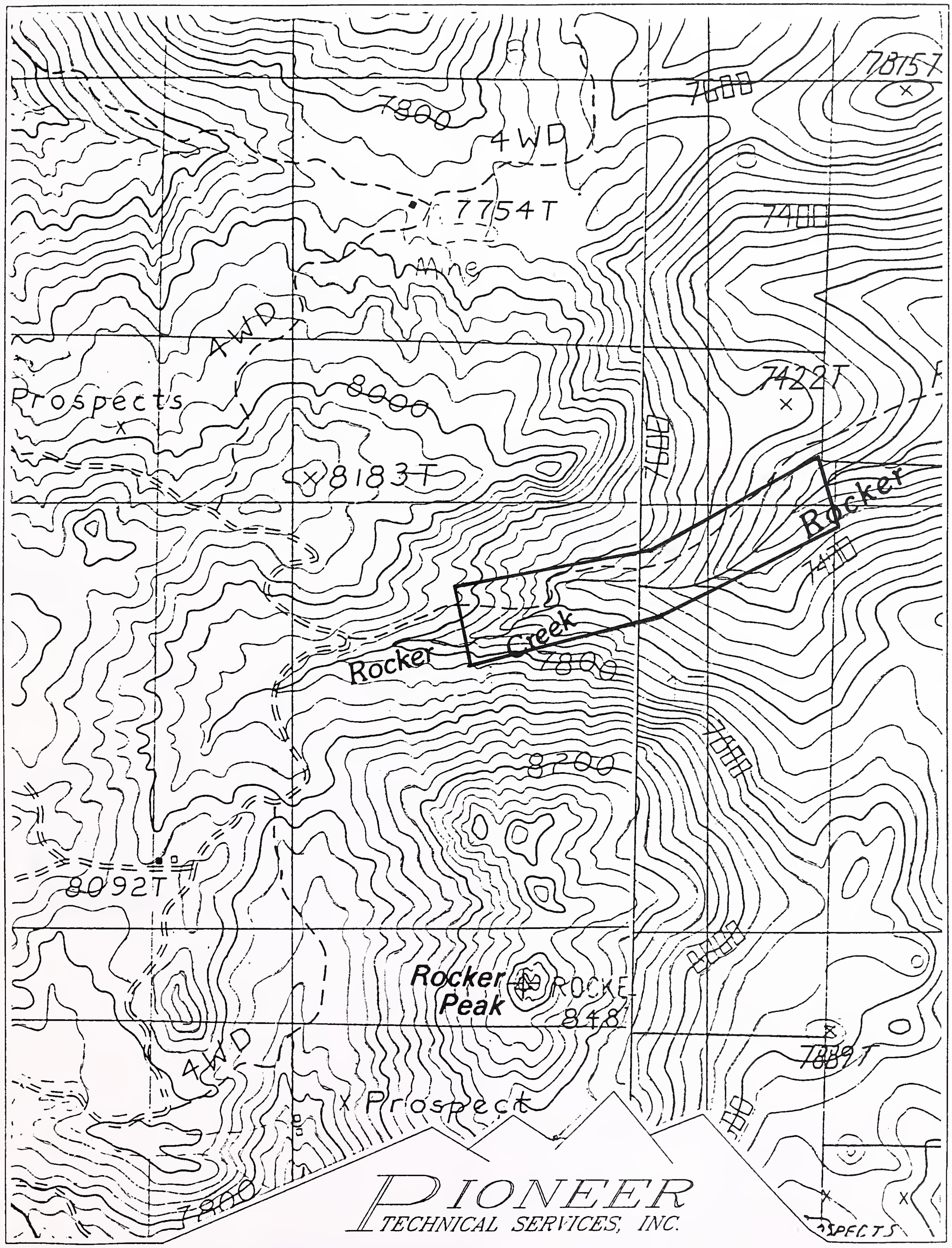
Other - **Yes** ___, **No** X, **#** ___, **Comment** ___

Mill Operation? **Yes** ___, **No** X. **If yes answer the next three questions:**

Period(s) of Operation: N/A

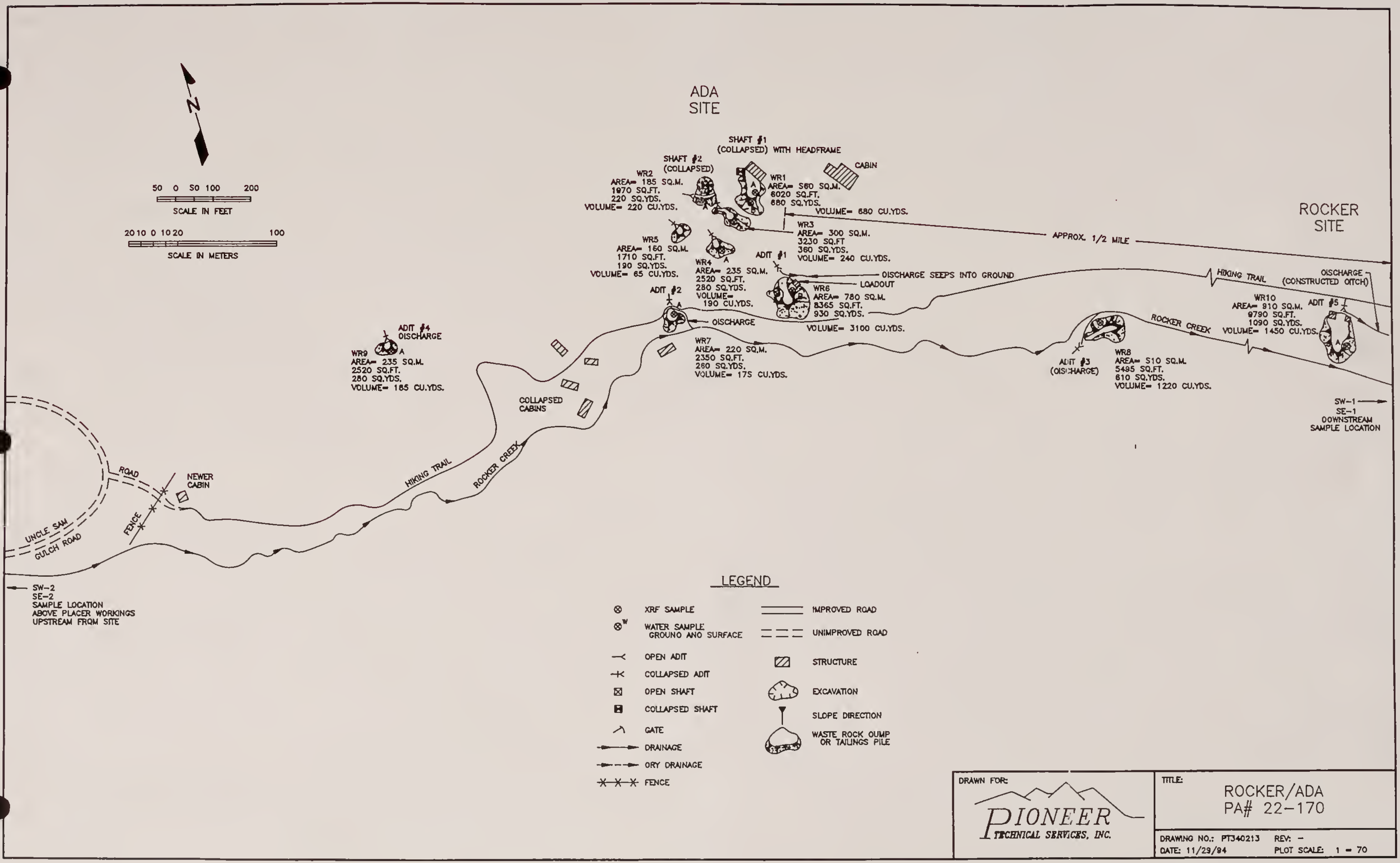
Origin of Ore Milled - Custom Mill ___ **Dedicated Mill** ___; **Number and names of mines that supplied mill feed:** N/A

Process? Hg-amalgam, CN⁻ leach (vat, heap), floatation, smelting?
N/A



PIONEER
TECHNICAL SERVICES, INC.

ROCKER/ADA, P.A. NO. 22–170
T07N, R05W, SECTION 17
SCALE: 1" = 1000'


N
50 0 50 100 200
SCALE IN FEET
20 10 0 10 20 100
SCALE IN METERS
ADA SITE
SHAFT #1 (COLLAPSED) WITH HEADFRAME
SHAFT #2 (COLLAPSED)
CABIN
WR1 AREA= 560 SQ.M. 6020 SQ.FT. 680 SQ.YDS. VOLUME= 680 CU.YDS.
WR2 AREA= 185 SQ.M. 1970 SQ.FT. 220 SQ.YDS. VOLUME= 220 CU.YDS.
WR3 AREA= 300 SQ.M. 3230 SQ.FT 360 SQ.YDS. VOLUME= 240 CU.YDS.
WR4 AREA= 235 SQ.M. 2520 SQ.FT. 280 SQ.YDS. VOLUME= 190 CU.YDS.
WR5 AREA= 160 SQ.M. 1710 SQ.FT. 190 SQ.YDS. VOLUME= 65 CU.YDS.
WR6 AREA= 780 SQ.M. 8365 SQ.FT. 930 SQ.YDS. VOLUME= 3100 CU.YDS.
WR7 AREA= 220 SQ.M. 2350 SQ.FT. 260 SQ.YDS. VOLUME= 175 CU.YDS.
WR8 AREA= 510 SQ.M. 5495 SQ.FT. 610 SQ.YDS. VOLUME= 1220 CU.YDS.
WR9 AREA= 235 SQ.M. 2520 SQ.FT. 280 SQ.YDS. VOLUME= 185 CU.YDS.
WR10 AREA= 910 SQ.M. 9790 SQ.FT. 1090 SQ.YDS. VOLUME= 1450 CU.YDS.
ADIT #1
DISCHARGE SEEPS INTO GROUND
LOADOUT
ADIT #2
DISCHARGE
ADIT #3 (DISCHARGE)
ADIT #4 DISCHARGE
ADIT #5
DISCHARGE (CONSTRUCTED DITCH)
ROCKER SITE
APPROX. 1/2 MILE
HIKING TRAIL
ROCKER CREEK
COLLAPSED CABINS
NEWER CABIN
ROAD
FENCE
UNCLE SAM GULCH ROAD
SW-1 SE-1 DOWNSTREAM SAMPLE LOCATION
SW-2 SE-2 SAMPLE LOCATION ABOVE PLACER WORKINGS UPSTREAM FROM SITE
A
LEGEND
XRF SAMPLE
WATER SAMPLE GROUND AND SURFACE
OPEN ADIT
COLLAPSED ADIT
OPEN SHAFT
COLLAPSED SHAFT
GATE
DRAINAGE
DRY DRAINAGE
FENCE
IMPROVED ROAD
UNIMPROVED ROAD
STRUCTURE
EXCAVATION
SLOPE DIRECTION
WASTE ROCK DUMP OR TAILINGS PILE

DRAWN FOR:

PIONEER
TECHNICAL SERVICES, INC.

TITLE:

ROCKER/ADA
PA# 22-170

DRAWING NO.: PT340213 REV: -
DATE: 11/29/94 PLOT SCALE: 1 = 70

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - *Use table on following page.*

Unique source identification: (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures/vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - *If tailings impoundments are also present, complete the following questions.*

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: Bullock, Bisch, West

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1A	WR	680	East side of large dump associated with Shaft #1 with headframe; orange/brown sand	None	6.2 (D)	0.105	22-170-WR-1	06/16/94 1210	T-Metals, ABA
WR-1B	WR		West side of dump; yellow/gray sand/gravel	None	3.8 (D)	0.055			
WR-2	WR	220	Small dump associated with Shaft #2; mixed gray/orange sand/gravel	None	< 3.5 (D)	0.5	22-170-WR-2	06/16/94 2000	T-Metals, ABA
WR-3	WR	240	Small dump associated with Adit #1; orange/brown sand/gravel	None	6.0 (D)	0.06			
WR-4	WR	190	Associated with Adit #2; light brown sand/gravel	None	6.5 (D)	0.07			
WR-5	WR	65	Small dump associated with Adit #3 (partially vegetated)	N/A	N/A	N/A	N/A	N/A	N/A
WR-6A	WR	3,100	West side of large dump with loadout; mixed gray/brown sand/gravel	None	4.8 (D)	0.08			
WR-6B	WR		East side of dump gray/tan sand/gravel	None	5.1 (D)	0.1			
WR-7	WR	175	West of main mine (WR-6), small dump near trail (toe of dump in floodplain)	None	6.2 (D)	0.065	22-170-WR-3	06/16/94 2000	T-Metals, ABA
WR-8	WR	1,220	Dump on south side of Rocker Creek, center of north face; mixed gray/orange sand/gravel	None	5.4 (D)	0.06			
WR-9	WR	185	Dump associated with Adit #4; top center	None	6.4 (D)	0.07			
WR-10	WR	1,450	Rocker site, east side near top; mixed gray/orange sand/gravel	None	5.4 (D)	0.06	22-170-WR-4	06/16/94 2000	T-Metals, ABA

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-170-WR-1 is composite of WR-1A and -1B, WR-3, WR-4, and WR-6A and -6B. 22-170-WR-2 is grab of WR-2. 22-170-WR-3 is composite of WR-7 and WR-8. 22-170-WR-4 is grab of WR-10. Note: Higher radioactivity readings on WR-1A and WR-1B. See Boulder Chief (22-132) for background soil sample.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes_X_, **No**___, **Number:**_5_ **Identification:**_AD-1, AD-2, AD-3, AD-4, AD-5_

Filled shafts: Yes___, **No**_X_, **Number:**___ **Identification:**___

Seeps/Springs: Yes___, **No**___, **Number:**___ **Identification:**_Unknown; significant snowmelt occurring during this investigation, unable to distinguish between seeps/springs and runoff._

Groundwater wells within 4 miles?: Yes_X_, **No**___;
Number of well logs:_7_

Distance to nearest well used for drinking:
___**<1,000 ft;**___**1,000 ft to 0.5 miles;**_X_**>0.5 miles.**

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite___, **Probable**___, **Possible**_X_, **Unlikely**___.
Precipitation and snowmelt could percolate through waste sources an cause metals liberation/migration from uncontained sources containing elevated metals. Groundwater appears to be fairly shallow.

Approximate Depth to Groundwater:_X_**<25 ft;**___ **25 - 100 ft;**___ **>100 ft.**

Other observations/notes:_N/A_

GROUNDWATER INVENTORY FORM

SAMPLERS: Bullock

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
AD-1	AD	Discharge associated with WR-6; flows over east side of WR-6 and seeps into ground after flowing 40' (noticeable channel where discharge flows on east side of dump with iron precip. in channel)	1.5 gpm (E)	2.84	929	443.3	7.4	0	N/A	22-170-AD-1	06/16/94 1300	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
AD-2	AD	Discharge from Adit #5 and WR-7 on path west of main workings (WR-6)	2 gpm (M)	6.33	107	201	5.8	12	N/A	22-170-AD-2	06/16/94 1330	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
AD-3	AD	Discharge associated with WR-8 on south side of creek	4 gpm (E)	7.3	180	115	3.4	36	N/A	22-170-AD-3	06/16/94 1530	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
AD-4	AD	Discharge from uppermost adit near new cabin	1 gpm (E)	5.86	102	234	3.3	2	N/A	22-170-AD-4	06/16/94 1550	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
AD-5	AD	Rocker site adit discharge	0.5 gpm (E)	3.46	422	477.5	3.5	0	N/A	22-170-AD-5	06/16/94 1700	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ____________________

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: **Yes**_X_, **No**___, **Name(s):** Rocker Creek

Dry streambeds: **Yes**___, **No**_X_, **Name(s):**___

Other surface water: **Yes**___, **No**_X_, **Name(s)/Description:**___

Waste materials within any floodplain: **Yes**_X_, **No**___ **Source ID(s):** WR-7 and WR-8

Approximate Flood frequency?_X_**1 yr,**___**10 yr,**___**100 yr**

Estimated seasonal flow of stream(s) (cfs/gpm)? 1.8 cfs
High Flow: 7.5 cfs, **Average Flow:** 0.75 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: **Yes**_X_, **No**___,
Describe: AD-1 discharge flows over WR-6; AD-2 discharge flows over WR-7; AD-3 discharge flows over WR-8; AD-4 discharge flows over WR-9; and, AD-5 discharge flows over WR-10.

Surface water use within 15 miles downstream? **(Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)**
Irrigation, agriculture, fishery, and wetlands

Observed erosional/sedimentation/stream turbidity problems? **Yes**___, **No**_X_. **Distance downstream (ft)?** **0-500**___; **500-1,000**___; **>1,000**___.
Describe/explain **(Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):**___

SURFACE WATER INVENTORY FORM

SAMPLERS: Bullock, Bisch

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	Downstream Rocker Creek	6.74	88	3.7	6	1.8 cfs (M)	22-170-SW-1	06/16/94 1705	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-1	SE	Downstream Rocker Creek	N/A	N/A	N/A	N/A	N/A	22-170-SE-1	06/16/94 1705	T-Metals
SW-2	SW	Upstream Rocker Creek	6.60	102	3.4	9	0.5 cfs (E)	22-170-SW-2	06/16/94 1710	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-2	SE	Upstream Rocker Creek	N/A	N/A	N/A	N/A	N/A	22-170-SE-2	06/16/94 1710	T-Metals

*FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ____________

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides? (SO_3)

Presence of evaporative salt deposits? (ESD)

Discolored or turbid seepage? (SPG)

Presence of long filamentous algae in drainages, mosses in moist areas?

Presence of ferric hydroxide precipitates? (FEOX)

Presence of burned or stressed vegetation? (VEG)

pH ≤ 5.0 (pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? None

Wetlands present: Yes___, No_X_, Describe:

Carbonate rocks/soils: Yes___, No_X_, Describe: Unlikely area; most likely underlain by volcanics/quartz monzonite.

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10_X_; 10-30___; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments

Nearest residence:___<1,000 ft;___1,000 ft - 0.5 miles;_X_>0.5 miles.

For each source (table next page):

Available fine materials? *Surface area?*

Uncovered and unvegetated? *Wet or dry?*

Overall dust propagation potential:
observed *high* *moderate* *low* *none*

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Bullock, Bisch, West

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
WR-1	Abundant SO3; pH; FEOX	Moist from snowmelt	6,020	5,720	Yes	Low
WR-2	Abundant SO3; pH; FEOX	Moist from snowmelt	1,970	1,775	Yes	Low
WR-3	Moderate SO3; FEOX	Moist from snowmelt	3,230	2,745	Yes	Low
WR-4	Moderate SO3	Moist from snowmelt	2,520	2,140	Yes	Low
WR-5	None	Moist from snowmelt	1,710	690	No	None
WR-6	Abundant SO3; pH	Moist from snowmelt	8,365	8,365	Yes	Low
WR-7	Moderate SO3	Moist from snowmelt	2,350	2,115	No	Low
WR-8	Moderate SO3; FEOX	Moist from snowmelt	5,495	4,395	Yes	Low
WR-9	None	Moist from snowmelt	2,520	2,270	Yes	Low
WR-10	Abundant SO3; FEOX	Moist from snowmelt	9,790	9,790	Yes	Low
AD-1	FEOX precip.; pH	N/A	N/A	N/A	N/A	N/A
AD-2	None	N/A	N/A	N/A	N/A	N/A
AD-3	FEOX precip.; moderate filamentous algae	N/A	N/A	N/A	N/A	N/A
AD-4	None	N/A	N/A	N/A	N/A	N/A
AD-5	FEOX precip.; pH; moderate filamentous algae	N/A	N/A	N/A	N/A	N/A

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes_____, No_X_
Describe:____

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments__None____

Evidence of recreational use on site: Yes_X_, No___, Describe:__Snow covering possible evidence of recreational use; however, hunters and hikers likely frequent the area.

Accessibility (check each that apply):___Easily accessible - no fences, gates, or warning signs;_X_Moderately Accessible - barbed wire fences, road gated, or signs posted;___Difficult Access - chain-link fence, road gated and locked, site guarded (does not include locked or manned access points located more than 0.5 miles from the actual site).

Sensitive environments on-site or adjacent to site:
State or National Parks - Yes___, No_X_, Comment________________
Wilderness Area - Yes___, No_X_, Comment________________
T&E Species Habitat - Yes___, No_X_, Comment________________
Bat Habitat - Yes___, No_X_, Comment________________

Primary Drainage_X_; Secondary Drainage___; No Information___:
Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium___, Low_X_
Fisheries Habitat and Species Classification - _4_
Sport Fishery Classification - _4_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, No___, Number_1_, types and locations:___
Shaft #1

Hazardous structures: Yes_X_, No___, Number_2_, types and locations:_
Shaft #1 headframe; loadout

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____, types and locations:_____________________________

Unstable waste piles, impoundments, undercut banks: Yes_X_, No____, Number_2_, types and locations:__WR-7 and WR-8 are being undercut by Rocker Creek.

Fire and/or Explosion hazards: Yes___, No_X_, Explain:________________

Bibliography

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USGS, Topographic Maps, Basin and Mount Thompson, Montana, 7 1/2 minute Quadrangles, 1985.

LABORATORY ANALYTICAL DATA

ROCKER/ADA
PA NO. 22-170

MDSL AMRB/PIONEER 5/16/94

Rocker/ADA PA# 22-170
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BULLOCK
INVESTIGATION DATE: 06/16/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-170-SE1	0.5 U	135 JX	32.0	3.1 JX	34.2	4.9 J	305 J	14800 J	0.07 J	1650 JX	4.3	93.1 JX	5.5 UJ	258	NR
22-170-SE2	0.6 U	14.8 JX	76.6	0.8 JX	8.2	10.3 J	6.6 J	15900 J	0.06 J	604 JX	2.0	30.7 JX	6.6 UJ	33.6	NR
22-170-WR1	92	797 JX	28.3	1.6 JX	1.6	1.9 J	159 J	31800 J	1.25 J	106 JX	1.4 U	2120 JX	123 J	77.6	NR
22-170-WR2	116	1190 JX	32.2	1.9 JX	34.2	0.8 UJ	1030 J	55500 J	0.26 J	21.1 JX	4.1	3690 JX	631 J	42.4	NR
22-170-WR3	6.7	1010 JX	17.6	1.3 JX	2.0 U	2.2 J	245 J	17200 J	0.51 J	148 JX	1.9 U	1030 JX	42.3 J	121	NR
22-170-WR4	40.4	601 JX	18.2	0.5 UX	1.5 U	0.8 UJ	270 J	14100 J	0.52 J	8.0 JX	1.4 U	5440 JX	61.4 J	63.5	NR
BACKGROUND	0.6 U	23.1	178	2.0 J	9.7	3.9	23.1	13600	0.04 J	1280	3.4	42.3	6.4 UJ	120	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-170-WR1	0.61	19.1	-3.67	-23	0.56	<0.01	0.05	0.00	-3.67
22-170-WR2	3.83	120	-9.13	-129	0.68	1.33	1.82	41.5	-50.7
22-170-WR3	0.15	4.69	-2.22	-6.9	0.14	<0.01	0.01	0.00	-2.22
22-170-WR4	0.33	10.3	-3.15	-14	0.30	0.01	0.02	0.31	-3.46

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-170-AD1	26.3 JX	3310	10.9	47.9	245	4.7 U	6170	147000	0.11 U	11800	42.4	256	58.7	6810	138
22-170-AD2	0.19 JX	79.9	2.1 U	2.6 U	8.7 U	4.7 U	16.4	140	0.11	7.6	8.0 U	1.8	29.4 U	234	27.2
22-170-AD3	0.12 UX	47.2	23.8	2.6 U	8.7 U	4.7 U	22.2	6200	0.11 U	1580	9.8	10.5	29.4 U	239	65.3
22-170-AD4	0.31 JX	82.7	4.9	2.6 U	8.7 U	4.7 U	17.3	839	0.13	381	8.0 U	16.6	29.4 U	138	7.7
22-170-AD5	0.20 JX	2.9	21.6	24.5	53.4	4.7 U	1600	6900	0.11 U	2250	15.2	20.5	29.4 U	3930	69.8
22-170-SW1	0.12 UX	11.9	6.3	4.4	8.7 U	4.7 U	51.7	692	0.11	68.9	8.0 U	1.1 U	29.4 U	56.1	15.0
22-170-SW2	0.12 UX	3.9	9.6	2.6 U	8.7 U	4.7 U	4.6 U	373	0.16	26.9	8.0 U	1.6	29.4 U	4.5 U	10.1

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-170-AD1	669	<5	521	<0.05	NR
22-170-AD2	59	<5	15	<0.05	NR
22-170-AD3	88	<5	30	<0.05	NR
22-170-AD4	7.0	<5	<5	<0.05	NR
22-170-AD5	218	<5	117	<0.05	NR
22-170-SW1	45	<5	8.0	<0.05	NR
22-170-SW2	13	<5	<5	<0.05	NR

LEGEND

SE1 - Downstream Rocker Creek.
SE2 - Upstream Rocker Creek.
WR1 - Composite of subsamples WR1A, 1B, 3, 4, 6A, and 6B.
WR2 - Grab sample of the WR2 subsample.
WR3 - Composite of subsamples WR7 and 8.
WR4 - Grab sample of the WR10 subsample.
BACKGROUND - From the Boulder Chief Mine (22-132-SS1).

AD1 - Discharge associated with WR6; flows over east side of WR6 and flows into ground 40' from dump.
AD2 - Discharge from Adit #5 and WR7 on path west of main workings (WR6).
AD3 - Discharge associated with WR8 on the south side of the creek.
AD4 - Discharge from the uppermost adit near new cabin.
AD5 - Rocker site adit discharge.
SW1 - Same as sample 22-170-SE1.
SW2 - Same as sample 22-170-SE2.

XRF ANALYSIS RESULTS

ROCKER/ADA
PA NO. 22-170

Mine Name: Rocker/Ada PA# 22-170
XRF Field Analyses
Results In PPM

XRF SAMPLE I.D.	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Ni	Cu	Zn	As	Sr
22-170-WR10		40046	1347.59	2057.26		654.133 *	46766.2			277.713 *	129.293 *	1292.45	95.7484
22-170-WR1A		25595.2	1306.44	2036.69		780.557 *	74716.6			100.712 *	204.302 *	1051.96	150.46
22-170-WR1B		38604.9	1674.01	1424.4		740.274	62284.5			106.492 *		189.926 *	61.7389
22-170-WR1-COMP		37753.8	1865.25	1575.48	285.219 *	686.153 *	45185			195.554 *	130.751 *	989.319	121.79
22-170-WR2		26565.2	1939.97	770.965		865.086 *	69889.9			827.21	138.146 *	1555.94	60.7886
22-170-WR3		23877.6	3119.3	1074.99		1251.55 *	32993			278.608 *	59.9466 *	656.622	137.627
22-170-WR3-COMP		34081	1682.15	1250.21		1187.25 *	35860.3			235.447 *	213.501 *	2208	44.1302 *
22-170-WR4		28331.8	2028.6	1831.57		1053.8 *	38476.8			218.585 *	96.3686 *	2418.38	121.369
22-170-WR6A		33644.4	1490.99	1292.24		454.517 *	27221.8			271.257 *	58.0274 *	809.652	89.4983
22-170-WR6B		42642.4	1587.77	1164.7		494.518 *	26154			225.094 *	65.2869 *	672.967	114.359
22-170-WR7		29499.6	2083.88	2294.15		1187.94 *	36188.1			516.526	145.653 *	1796.44	130.368
22-170-WR8		35306.8	1865.36	1208.09	230.535 *	897.004 *	31007.8			186.641 *	199.422 *	1942.48	57.2001
22-170-WR9		30054.7	2020.2	1919.15		5006.18	31751.8			134.338 *	287.223	196.267 *	75.4126

XRF SAMPLE I.D.	Zr	Hg	Mo	Pb	Rb	Cd	Sn	Sb	Ba	Ag	U	Th
22-170-WR10	240.672		34.6897 *	3570.59	295.728			178.374 *	428.101			27.2372 *
22-170-WR1A	199.068			67.1722 *	215.367				421.601			
22-170-WR1B	149.59		21.1331 *	510.775	350.393			176.017 *	404.689			37.0124
22-170-WR1-COMP	203.194		19.093 *	966.071	353.93			353.651	431.35			69.8696
22-170-WR2	70.0118		66.1654	2379.96	468.005			1152.64	162.155	203.91 *		299.596
22-170-WR3	133.642			261.964	205.964			96.3688 *	177.16			31.1186 *
22-170-WR3-COMP	169.031		18.5621 *	1518.95	266.513			183.442 *	171.078			
22-170-WR4	132.128		32.3895	1751.1	322.196			959.442	284.792			134.664
22-170-WR6A	151.103		34.796	1968.82	435.279			271.886	386.264	116.941 *		158.47
22-170-WR6B	188.66		23.9739 *	1592.1	384.591			294.807	576.521			68.6462
22-170-WR7	229.679		11.727 *	1322.56	277.99			168.895 *	466.056			22.3575 *
22-170-WR8	161.582		28.0947 *	1453.11	241.995			166.44 *	136.686			
22-170-WR9	197.517		8.88124 *	244.163	278.572				280.666			25.2226 *

* = Estimated Quantity

$ = Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)
SCORESHEET

ROCKER/ADA
PA NO. 22-170

MDSL AMRB/PIONEER 5/16/94

AIMSS SCORESHEET

SITE NAME: Rocker/Ada
PA NUMBER: 22-170

LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	21.844
6	GW - TARGETS	WELLS - 1 MI. x 2.5		0.0
7		WELLS - 1 TO 4 MI		7
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	7.0
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	61163
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		300
12		EXCEEDENCES		50
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	750
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	23.900
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19		FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	18
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	322650
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		5
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	25
27		LIKELIHOOD SCORE	LINES 25 + 26C	25
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.476
29	AIR - TARGETS	POPULATION - 4 MILES		1
30		NEAREST RESIDENCE		0
31		WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	1
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	12
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		50
37A		ACCESSIBILITY		10
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	50
38		LIKELIHOOD SCORE	LINES 36 + 37C	100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.432
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		0
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		2
43		TARGETS SCORE	SUM LINES 40 THRU 42	2
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	86
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE (LINES 10 + 24 + 35 + 44) / 100,000			3.84

SITE NAME: Rocker/Ada
PA NUMBER: 22-170

LINE NO.		SITE SAFETY		
1	THREAT	ACCESSIBILITY		10
2		OPEN SHAFTS	100 EA.	100
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	80
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	180
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		2
12		TARGETS SCORE	SUM LINES 9 THRU 11	2
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	3.60

SUMMARY OF HISTORICAL ANALYTICAL DATA

FROM OTHER SOURCES

From Ted Duaime, MBM

LAB ID	SAMPLE ID	ANALYSIS	Cr	c	q	Ni	c	q	Cu	c	q	Zn	c	q	As	c	q	Ag	c	q	Cd	c	q	Ba	c	q
Lady Leith Mine																										
92Q358	BLLS10L	DISS. METALS	0.00	U		0.00	U		0.00	U		5.69	B		3.81	B		0.00	U		0.00	U		8.66	B	
92Q362	BLLS20H	DISS. METALS	0.00	U		6.62	B		37.08	B		1282.00			2.08	B		0.00	U		14.42			16.13	B	
92Q359	BLLS30L	DISS. METALS	0.00	U		0.00	U		0.00	B		37.17	B		5.10	B		0.00	U		0.00	U		9.65	B	
92Q360	BLLS40H	DISS. METALS	0.00	U		1.43	U		0.00	U		312.82			10.80	B		0.00	U		0.00	U		8.35	B	
92Q361	BLLS50L	DISS. METALS	0.00	U		0.00	U		0.00	U		32.95	B		4.60	B		0.00	U		0.00	U		8.01	B	
92Q1140	BLLS10L	TR METALS	0.00	U		0.00	U		0.00	U		7.12	B		5.19	B		0.00	U		0.00	U		7.63	B	
92Q1141	BLLS30L	TR METALS	0.00	U		0.00	U		0.00	U		24.25	B		6.50	B		0.00	U		0.00	U		7.33	B	
92Q1142	BLLS40H	TR METALS	0.00	U		7.86	B		0.00	U		47.01			12.05	B		0.00	U		0.00	U		9.24	B	
92S364	BLLD10H	TOTAL METALS	4.42	B	N	4.30	B	N	20.78	B	N	190.09			264.71			3.02	B	N	1.49	B	N	47.78	B	N
92S363	BLLD20H	TOTAL METALS	1.33	B	N	5.16	B	N	78.68		N	729.80			3146.00			16.14	B	N	4.27	B	N	29.73	B	N
92S365	BLLD30H	TOTAL METALS	6.91	B	N	4.01	B	N	294.94		N	828.49			356.01			0.00	U	N	9.91	B	N	77.84	B	N
Ada Mine																										
92Q684	CADS20L	DISS. METALS	0.00	U		0.00	U		0.00	U		0.00	U		1.45	B		0.00	U		0.00	U		8.36	B	
92Q687	CADS30L	DISS. METALS	1.78	B		0.00	U		2.75	B		0.00	U		1.87	B		0.00	U		0.00	U		9.86	B	
92Q688	CADS40L	DISS. METALS	0.00	U		0.00	U		21.58	B		527.77			82.62			0.00	U		4.31	B		1.14	B	
92Q686	CADS50L	DISS. METALS	0.00	U		0.00	U		159.40			189.61			0.70	B		0.00	U		1.70	B		7.84	B	
92Q685	CADS60H	DISS. METALS	1.35	B		41.44	B		4127.00			6180.00			1555.00			1.14	B		50.29			10.51	B	
92S692	CADD10H	TOTAL METALS	3.05	B		1.98	B		123.30		N	108.89		N	2953.49			3.29	B		0.00	U		65.55	B	
92S693	CADD20H	TOTAL METALS	3.22	B		1.61	B		81.97		N	101.58		N	2260.94			0.00	U		0.00	U		72.24	B	
Boulder Chief Mine																										
92Q569	CBCS10H	DISS. METALS	2.19	B		13.84	B		4506.00			18540.00			1.59	B		3.84	B		1137.00			21.99	B	
92Q570	CBCS20H	DISS. METALS	0.00	U		0.00	U		18.37	B		1410.00			0.89	B		0.00	U		11.14			5.96	B	
92Q956	CBCS20H	TR METALS	0.00	U		0.00	U		48.85	B		1590.00			21.93			11.54	B		56.84			14.94	B	
92S572	CBCD11H	TOTAL METALS	3.72	B		3.24	B		188.13			4402.52			38.61			37.96			36.42		N	39.63	B	
Ida M Mine																										
92Q656	CIMS10H	DISS. METALS	0.00	U		35.82	B		95.08			16090.00			2.20	B		0.00	U		156.66			34.09	B	
92Q571	CIMS20H	DISS. METALS	0.00	U		17.29	B		184.50			5267.00			0.00	U		0.00	U		93.44			35.43	B	
92Q962	CIMS10H	TR METALS	0.00	U		34.16	B		86.32			24700.00			2.05	B		0.00	U		130.58			29.87	B	
92Q957	CIMS20H	TR METALS	0.00	U		18.35	B		203.25			6404.00			20.21			8.56	B		97.23			61.30	B	
Rocker Mine																										
92Q689	CROS10H	DISS. METALS	0.00	U		30.47	B		851.40			2453.00			2.48	B		0.00	U		19.89			30.77	B	
92S691	CROD10L	TOTAL METALS	4.97	B		4.11	B		114.51		N	90.83		N	1016.73			1.38	B		0.00	U		84.77	B	
92S690	CROD20H	TOTAL METALS	4.73	B		4.34	B		182.11		N	110.85		N	691.39			0.00	U		0.34	B		42.69	B	

SUBJECT TO REVIEW

SUBJECT TO REVIEW

LAB ID	SAMPLE ID	ANALYSIS	Pb	c	q	Hg	c	q
Lady Leith Mine								
92Q358	BLLS10L	DISS. METALS	0.54	B		0.00	U	
92Q362	BLLS20H	DISS. METALS	218.24			0.00	U	
92Q359	BLLS30L	DISS. METALS	1.08	B		0.08	B	
92Q360	BLLS40H	DISS. METALS	0.00	U		0.00	U	
92Q361	BLLS50L	DISS. METALS	3.19	B		0.00	U	
92Q1140	BLLS10L	TR METALS	0.87	B		0.30		
92Q1141	BLLS30L	TR METALS	6.05			0.10	B	
92Q1142	BLLS40H	TR METALS	7.32			0.09	B	
92S364	BLLD10H	TOTAL METALS	315.73			0.54		
92S363	BLLD20H	TOTAL METALS	2404.00			0.63		
92S365	BLLD30H	TOTAL METALS	166.31			0.65		
Ada Mine								
92Q684	CADS20L	DISS. METALS	0.00	U		0.12	B	
92Q687	CADS30L	DISS. METALS	0.00	U		0.17	B	
92Q688	CADS40L	DISS. METALS	0.00	U		0.12	B	
92Q686	CADS50L	DISS. METALS	0.00	U		0.11	B	
92Q685	CADS60H	DISS. METALS	125.00			0.42		
92S692	CADD10H	TOTAL METALS	154.27			0.71		
92S693	CADD20H	TOTAL METALS	153.05			0.52		
Boulder Chief Mine								
92Q569	CBCS10H	DISS. METALS	36.16			0.23		
92Q570	CBCS20H	DISS. METALS	61.81			0.12		
92Q956	CBCS20H	TR METALS	1654.19			0.21		
92S572	CBCD11H	TOTAL METALS	3258.88			1.66		
Ida M Mine								
92Q656	CIMS10H	DISS. METALS	244.59			0.13		
92Q571	CIMS20H	DISS. METALS	80.30			0.06	B	
92Q962	CIMS10H	TR METALS	212.86			0.22		
92Q957	CIMS20H	TR METALS	1602.24			0.07	B	
Rocker Mine								
92Q689	CROS10H	DISS. METALS	15.33			0.27		
92S691	CROD10L	TOTAL METALS	356.61			0.57		
92S690	CROD20H	TOTAL METALS	99.06			0.82		

SUBJECT TO REVIEW

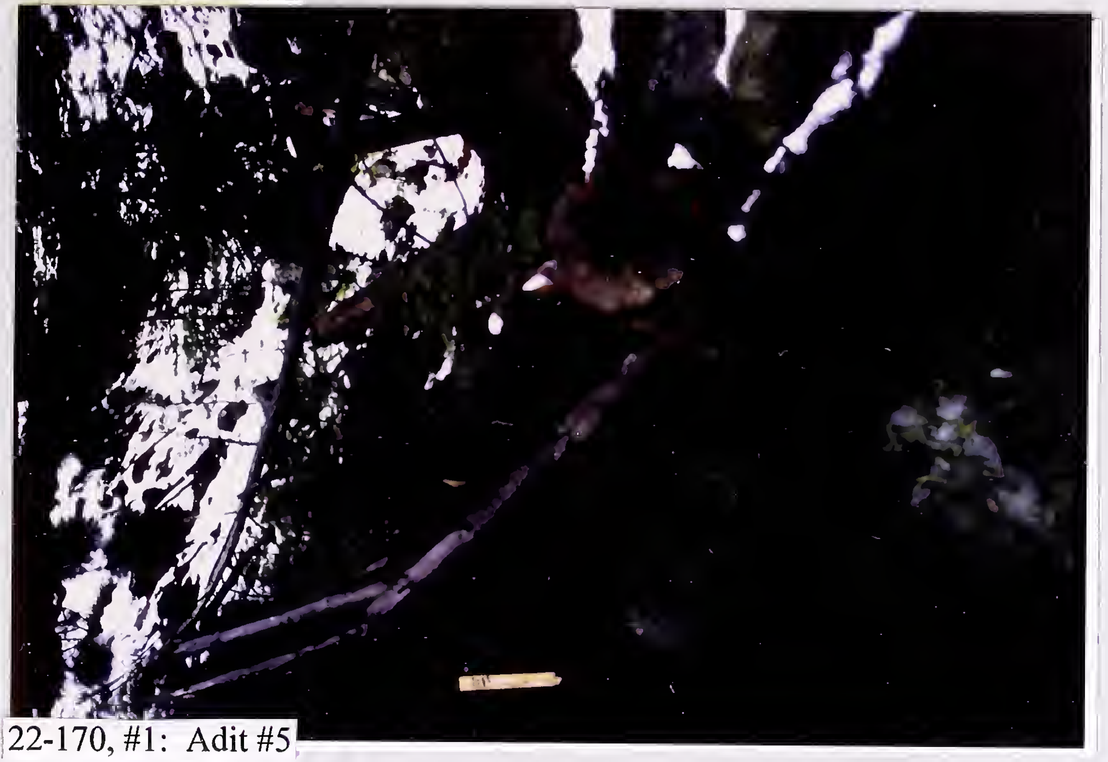
SUBJECT TO REVIEW

LabID's with 92Q are water
" " " 92S are soil

SUBJECT TO REVIEW

MBMG/Deerlodge National Forest
Abandoned Mine Assay Results

ID	#	Location	Description	Au	Ag	Cu	Pb	Zn
JJNA	1	North Ada, Jefferson Co. Trench	Composite mixture of overburden and old mine dumps stirred together.	0.008	0.600	0.230	0.370	0.070
JAJS	1	North Ada, Jefferson Co. Dump	Vein material selected. Sulfide-rich (up to 40%) py-sph-gal-cor, qtz-sid	0.076	8.580	0.810	2.850	2.480
JJRO	1	Rocker Mine, Jefferson Co. Dump	Select of vein, Vuggy-Qtz-py-sph-tef-cpy-gal-aspy-tovr	0.092	6.670	0.440	1.620	1.600
JJRO	2	Rocker Mine, Jefferson Co. Dump	Composite Ox-unox-Kqm-clt-to-qtz-gal-sen-py	0.110	1.460	0.069	0.730	0.041
JJLL	1	Lady Leith, Jefferson Co., Main Dumps	Select of vein; Li-sulfide (py, ab gal)	0.182	11.400	0.420	3.100	0.200
JJBC	1	Boulder Chief, Jefferson Co., Dump	Composite of main dump. Wallrock (Kvl alt to qtz-ser-py) same vein -qtz-chal-10%py	0.010	1.140	0.019	0.470	0.190
JJBC	2	Boulder Chief, Jefferson Co., Tailings	Composite of tailings- very coarse wallrock (alt) & qtz vein	0.018	4.340	0.055	2.320	3.870
JJAD	1	Ada, Jefferson Co., Dump.	Composite, Qtz-py vn, qtz-ser-py Kgm, & Fe-op st Kgm. both ox & unox.	0.004	3.750	0.057	0.320	0.005
JJAD	2	Ada, Jefferson Co., Dump	Chip Channel-5' width across vein (50%) & ox-alf Kgm. Poddy veins; 18" max width Qtz-py-sph-gal-tert(?).	0.024	1.540	0.060	0.190	0.110


22-170, #1: Adit #5

22-170, #2: WR-10 and associated cabin

22-170, #3: SW-1 sample location

22-170, #23: WR-1; Shaft #1 and headframe

22-170, #24: Shaft #1

22-170, #25: WR-2

22-170, #26: WR-3

22-170, #27: WR-4

22-170, #29: WR-6

22-170, #30: Adit #1 discharge

22-170, #32: Adit #2 discharge

22-170, #33: WR-7

22-170, #34: Adit #3 and WR-8

22-170, #36: Adit #4

22-170, #37: WR-9

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: CRAWLEY CAMP **PA#:** 22-028

Date: June 13, 1994 **Time:** 1145-1430

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Bisch, Clark, West; Pioneer

Visitors: None

Weather/Seasonality Observations: Heavy rainstorm; cool (approx. 55°F); gusty breeze from east; cloudy.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number)**:** No photos were taken. Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms)**:** Site is located in intermittent drainage in opening with heavy timber (Lodgepole and fir) on both sides of drainage; relatively steep terrain. Dumps are located directly under power line.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Remove dumps from drainage, recontour, and revegetate.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): CRAWLEY CAMP **PA#:** 22-028

Legal Description: **T** 7N **;R** 4W **;Sec.** 7 **,** SW **1/4** SW **1/4** ____ **1/4**

County: JEFFERSON **Mining District:** COLORADO

Latitude: N 46° 22' 04" **Longitude:** W 112° 09' 30"

Primary Drainage Basin and Code: Clancy Creek/10030101
Secondary Drainage Basin: Clancy Creek

USGS Quadrangle map name(s): Mount Thompson

Mine Type/Commodities: Hardrock/Unknown

Activity Status: **Active** ___ **,Inactive/Exploration** ___ **,Abandoned** X **.**

Ownership: Known Y ___ **N** X **; private/public?** Private
Owner, Agent, or Contact (Include address and phone when available)**:** Unknown

Relationship to other mines/sites in the area/district: One mile northeast of the Bluebird mine

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? N/A

General site features: Elevation 6500' **, Slope** 15° **,**
Aspect Eastern

Land use: Mining ___ **, Recreational** X **, Residential** ___ **, Urban** ___ **,**
Agricultural ___ **, Other(Specify)** ___

Area of disturbed/unvegetated lands? 1 **acre(s).**
Site Dimensions: 300 feet x 150 feet

Predominant vegetation types: Lodgepole pine, Douglas fir, blue bunch wheat grass

Access: roads - good (paved) ___ **,poor (maintained dirt road)** ___ **,**
4wd X **,trail** ___ **.**
Other logistical considerations (proximity to other sites). ___

Well logs within 1 mile radius; (Attach MBMG Well Log Printout(s): There are 5 wells reported within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site is underlain by an andesite remnant over the quartz monzonite of the Boulder batholith. Runoff from the site flows into Clancy Creek, which flows east into Prickly Pear Creek approximately 11 to 12 miles downstream.

Mining/milling history, ore type/tenor, host rock, gangue: No history available. Mineralization occurs as shoots along a granite dike and shale present in the area. Gangue is mostly tourmaline and quartz; mineralization is tetrahedrite and pyrite with sphalerite, galena, arsenopyrite, and some chalcopyrite occurring locally.

Mine Operation?
Shafts - Yes___, No X , # ____, Comment
Adits - Yes X , No___, # 2 **, Comment** Collapsed; 1 discharging
Pits - Yes___, No X , # ____, Comment
Placers - Yes___, No X , # ____, Comment
Other - Yes___, No X , # ____, Comment

Mill Operation? Yes____, No X . If yes answer the next three questions:

Period(s) of Operation: N/A

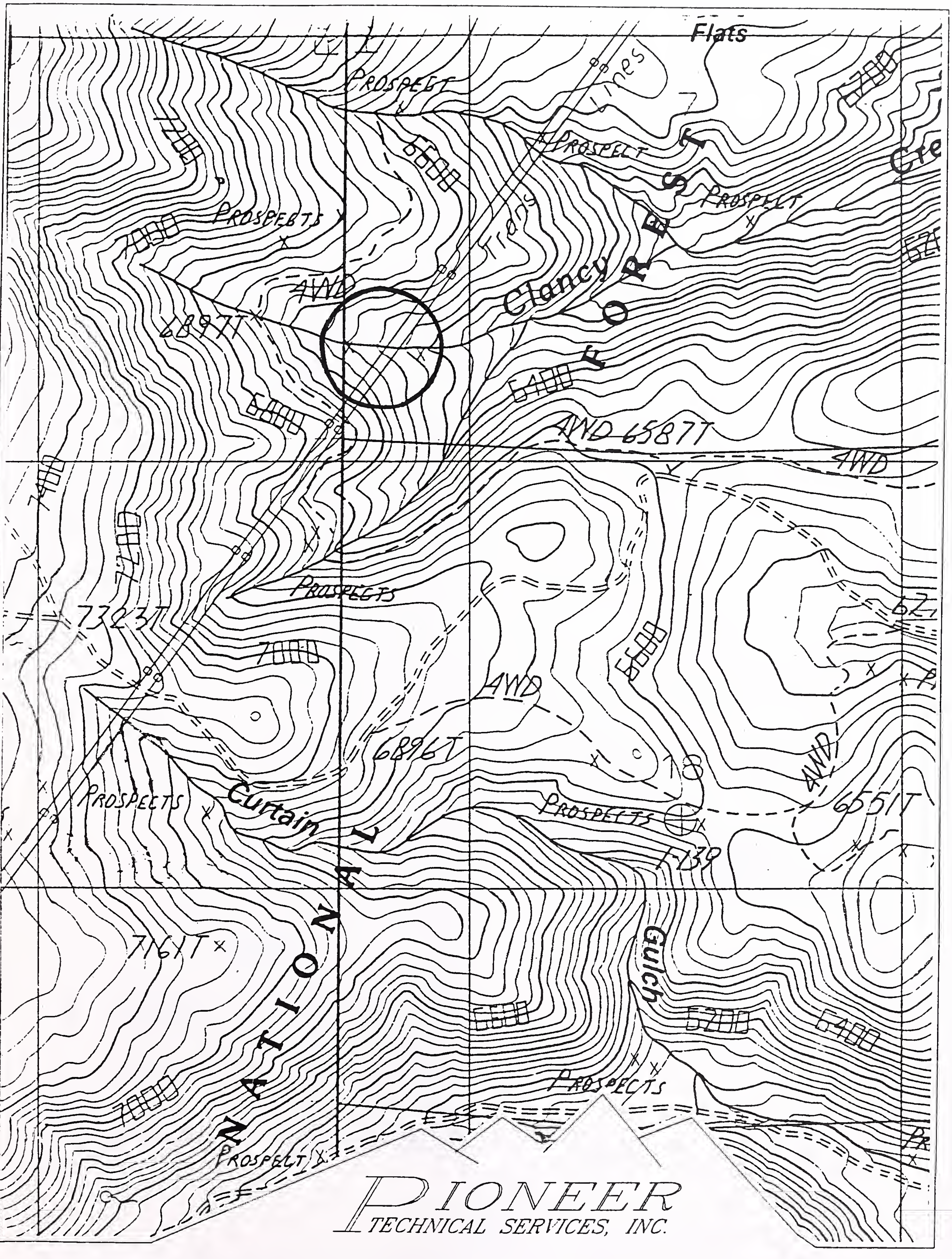
Origin of Ore Milled - Custom Mill___ Dedicated Mill___; Number and names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN$^-$ leach (vat, heap), floatation, smelting?
N/A

Montana Bureau of Mines and Geology
Water Well Log Data

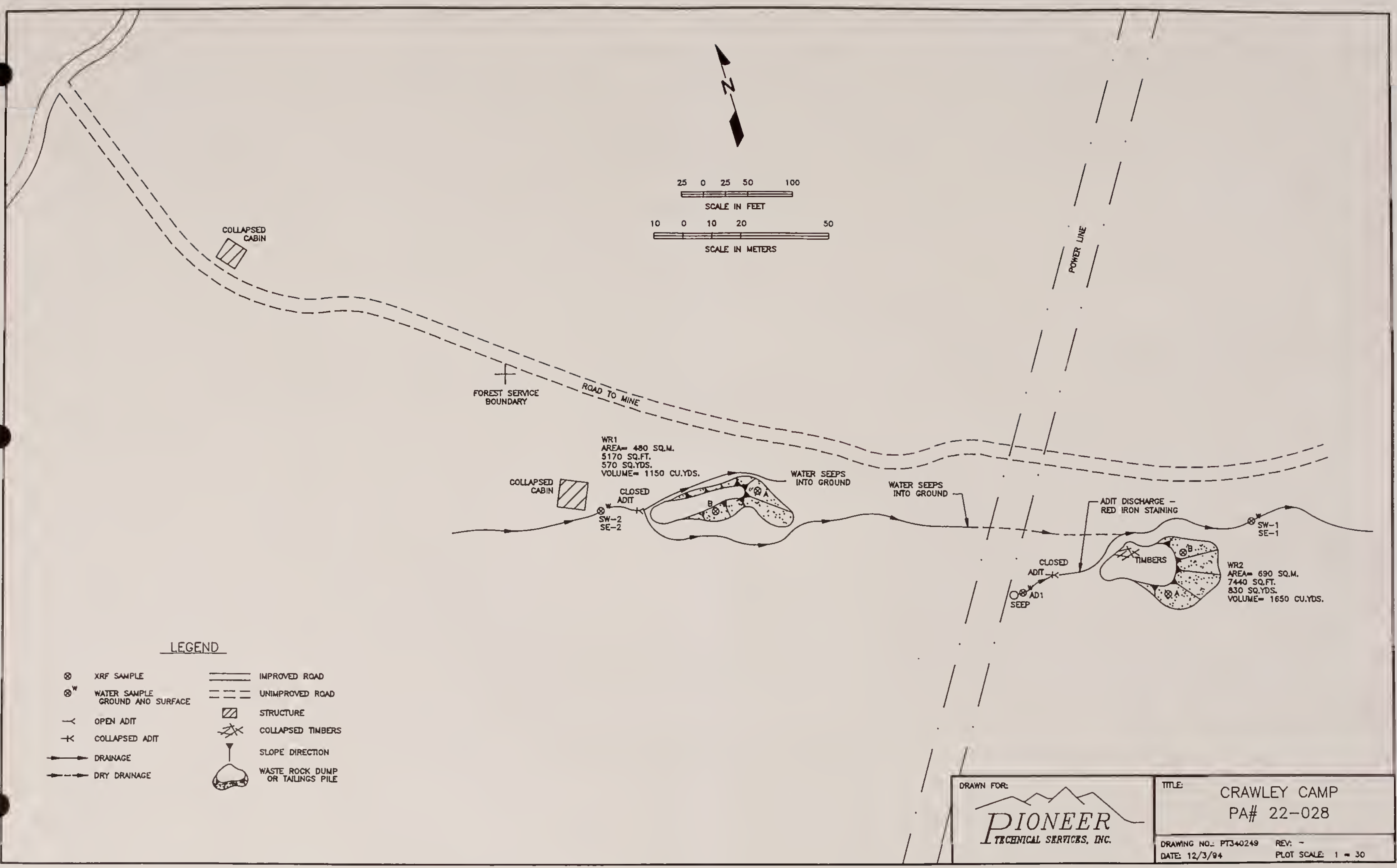
08/11/1994

Well No.	Location	Depth	Yield	Static Water Level
M:5430	07N 04W 05 CDCD	32.0	0.0	11.70
[illegible]:55788	07N 04W 06 B	105.0	5.0	6.00
M:55789	07N 04W 06 B	165.0	4.0	4.00
M:55790	07N 04W 07 DA	193.0	100.0	6.00
M:5431	07N 04W 08 BDBB	268.2	0.0	18.91



PIONEER
TECHNICAL SERVICES, INC.

CRAWLEY CAMP, P.A. NO. 22-028
T07N, R04W, SECTION 07
SCALE: 1" = 1000'



DRAWN FOR:
PIONEER
TECHNICAL SERVICES, INC.

TITLE:
CRAWLEY CAMP
PA# 22-028

DRAWING NO.: PT340249
REV: -
DATE: 12/3/94
PLOT SCALE: 1 = 30

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - *Use table on following page.*

Unique source identification: (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures/vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - *If tailings impoundments are also present, complete the following questions.*

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: Bullock, Bisch

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1A	WR	1,150	Northeast side of upper dump; gray/yellow sand	None	5.8 (D)	0.06	22-028-WR-1	06/13/94 1415	T-Metals, ABA
WR-1B	WR		West side of upper dump; orange/yellow sand	None	4.4 (D)	0.03			
WR-2A	WR	1,650	Northeast lobe of lower dump; orange sand/gravel	None	6.9 (D)	0.055	22-028-WR-2	06/13/94 1200	T-Metals, ABA
WR-2B	WR		Southwest lobe of lower dump; gray sand/gravel	None	5.9 (D)	0.04			

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-028-WR-1 is composite of WR-1A and -1B. 22-028-WR-2 is composite of WR-2A and -2B. See Boulder Chief (22-132) for background soil sample.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X **, No**___**, Number:** 1 **Identification:** AD-1

Filled shafts: Yes___**, No** X **, Number:**____ **Identification:**____

Seeps/Springs: Yes X **, No**_____**, Number:** 1 **Identification:** AD-1 discharge re-emerges as a seep in intermittent drainage between WR-1 and WR-2.

Groundwater wells within 4 miles?: Yes X **, No**___**;**
Number of well logs: 40

Distance to nearest well used for drinking:
___**<1,000 ft;**___**1,000 ft to 0.5 miles;** X **>0.5 miles.**

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite_____**, Probable**_____**, Possible** X **, Unlikely**_____**.**
Snow melt and precipitation could percolate through uncontained waste sources containing elevated metal values and cause liberation/migration of metals. Shallow groundwater is present.

Approximate Depth to Groundwater: X **<25 ft;**___ **25 - 100 ft;**___ **>100 ft.**

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

SAMPLERS: Bullock

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC $\mu S/cm$ @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
AD-1	AD	Adit discharge/seep above WR-2	35 gpm (E)	6.68	81	123.4	7.8	35	N/A	22-028-AD-1	06/13/94 1300	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): Adit discharge mixes with a seep emerging from drainage between WR-1 and WR-2.

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X , No___, Name(s): Upper Clancy Creek

Dry streambeds: Yes X , No___, Name(s): Upper Clancy Creek seeps into the ground for a short distance between WR-1 and WR-2; streambed is dry.

Other surface water: Yes X , No___, Name(s)/Description: Tributary downstream from site is approximately 700 feet downstream from WR-2.

Waste materials within any floodplain: Yes X , No___ **Source ID(s):** Intermittent stream flows along sides of WR-1 and WR-2.

Approximate Flood frequency? X 1 yr, ___10 yr, ___100 yr

Estimated seasonal flow of stream(s) (cfs/gpm)? 0.2 cfs
High Flow: 0.75 cfs , **Average Flow:** 0.15 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes____, No X ,
Describe:

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Irrigation, agriculture, wetland, and fishery

Observed erosional/sedimentation/stream turbidity problems? Yes_____, No X . **Distance downstream (ft)?** 0-500___; 500-1,000___; >1,000___.
Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Stream vegetation is not stressed except in the immediate area of adit discharge.

SURFACE WATER INVENTORY FORM

SAMPLERS: Bullock, Bisch

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	Downstream in upper Clancy Creek	7.12	75	8.5	30	0.2 cfs (M)	22-028-SW-1	06/13/94 1220	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-1	SE	Downstream in upper Clancy Creek	N/A	N/A	N/A	N/A	N/A	22-028-SE-1	06/13/94 1220	T-Metals
SW-2	SW	Upstream in upper Clancy Creek	5.03	73	25.1	34	0.1 cfs (M)	22-028-SW-2	06/13/94 1330	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-2	SE	Upstream in upper Clancy Creek	N/A	N/A	N/A	N/A	N/A	22-028-SE-2	06/13/94 1330	T-Metals
SE-500	SE	500' downstream from SE-1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ____________________

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides? (SO_3)

Presence of evaporative salt deposits? (ESD)

Discolored or turbid seepage? (SPG)

Presence of long filamentous algae in drainages, mosses in moist areas?

Presence of ferric hydroxide precipitates? (FEOX)

Presence of burned or stressed vegetation? (VEG)

pH ≤ 5.0 (pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? < 0.5 acre

Wetlands present: Yes___, No_X_, Describe:

Carbonate rocks/soils: Yes___, No_X_, Describe:

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30___; 30-100_X_; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments

Nearest residence:___<1,000 ft;___1,000 ft - 0.5 miles;_X_>0.5 miles.

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Bullock, Bisch

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
WR-1	Moderate SO3; pH; FEOX	Moist on west side	5,170	4,910	No	Low
WR-2	Moderate SO3; FEOX	Dry	7,440	7,440	No	Low
AD-1	FEOX precipitate; Algae	N/A	N/A	N/A	N/A	N/A

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes_____, No__X__.
Describe:____

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___; 300-1,000____; 1,000-3,000____; 3,000-10,000____; 10,000 or greater____;
Comments__None____

Evidence of recreational use on site: Yes_X_, No___, Describe:________
Vehicle tracks____

Accessibility (check each that apply):_X_Easily accessible - no fences, gates, or warning signs;___Moderately Accessible - barbed wire fences, road gated, or signs posted;___Difficult Access - chain-link fence, road gated and locked, site guarded (does not include locked or manned access points located more than 0.5 miles from the actual site).

Sensitive environments on-site or adjacent to site:
State or National Parks - Yes___, No_X_, Comment__________________
Wilderness Area - Yes___, No_X_, Comment__________________
T&E Species Habitat - Yes___, No_X_, Comment__________________
Bat Habitat - Yes___, No_X_, Comment__________________

Primary Drainage_X_; Secondary Drainage___; No Information___:
Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium_X_, Low___
Fisheries Habitat and Species Classification - _4_
Sport Fishery Classification - _4_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes___, No_X_, Number____, types and locations:___
Adit is collapsed.______________________________________

Hazardous structures: Yes_X_, No___, Number_2__, types and locations:_
Two collapsed cabins (low hazard potential).______________

Unstable highwalls, pits, trenches, slopes: Yes_X_, No___, Number_2__, types and locations:_Relatively steep slopes on dumps.____________
____

Unstable waste piles, impoundments, undercut banks: Yes_X_, No____, Number_2__, types and locations:_Dumps are at angle of repose._______
____

Fire and/or Explosion hazards: Yes___, No_X_, Explain:______________
____

Bibliography

MBMG, Mines and Mineral Deposits (Except Fuels), Jefferson County, Montana, Bulletin 16, Written by R.N. Roby, W.C. Ackerman, F.B. Fulkerson, and F.A. Crowley, June 1960.

MBMG, Well Log Database, July 14, 1994.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Lands National Inventory, Phase II Problem Area Data Sheet for Crawley Camp, Prepared by Dick Juntunen, August 29, 1981.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Crawley Camp, Prepared by Northern Engineering and Testing, June 13, 1988.

USGS, Topographic Map, Mount Thompson, Montana, 7 1/2 minute Quadrangle, 1985.

LABORATORY ANALYTICAL DATA

CRAWLEY CAMP
PA NO. 22-028

Crawley Camp PA# 22-028
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BULLOCK
INVESTIGATION DATE: 06/13/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-028-SE1	1.5 U	949	395	46.4 J	61.4	22.1	460	117000	0.12 J	37300	27.4	278	67.0 J	6440	NR
22-028-SE2	0.8 U	21.6	41.1	1.2 J	10.4	16.3	14.7	16500	0.04 U	603	10.0	30.2	8.4 UJ	72.4	NR
22-028-WR1	114	459	47.8	2.5 J	1.7 U	1.1	75.4	20300	0.07 J	28.9	2.1	1820	1150 J	228	NR
22-028-WR2	2.8	73.7	23.7	1.3 J	1.4 U	0.7 U	33.8	8250	0.43 J	12	1.2 U	553	6.0 J	58.8	NR
BACKGROUND	0.6 U	23.1	178	2.0 J	9.7 B	3.9	23.1	13600	0.04 J	1280	3.4	42.3	6.4 UJ	120	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-028-WR1	0.74	23.1	-4.72	-28	0.32	0.05	0.37	1.56	-6.28
22-028-WR2	0.19	5.94	-3.10	-9	0.18	<0.01	0.01	0.00	-3.10

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-028-AD1	0.43	50.8	5.7	2.6 U	8.7 U	4.7 U	12.9	5870	0.11 U	386	8.0 U	9.8	29.4 U	140	75.0
22-028-SW1	0.12 U	16.8	2.7	2.6 U	8.7 U	4.7 U	4.6 U	1390	0.11 U	225	8.0 U	4.7	29.4 U	75.9	72.1
22-028-SW2	0.12 U	4.0	3.6	2.6 U	8.7 U	4.7 U	4.6 U	370	0.11 U	20.7	8.0 U	2.9	29.4 U	4.7	53.7

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-028-AD1	116	<5	32	<0.05	NR
22-028-SW1	125	<5	32	<0.05	NR
22-028-SW2	80	<5	5.0	<0.05	NR

LEGEND

SE1 - Downstream in Upper Clancy Creek; iron staining from adit discharge; no vegetation.
SE2 - Upstream in Upper Clancy Creek.
WR1 - Composite of subsamples WR1A and 1B.
WR2 - Composite of subsamples WR2A and 2B.
BACKGROUND - From the Boulder Chief Mine (22-132-SS1).

AD1 - Adit discharge/seep above WR2.
SW1 - Same as sample 22-028-SE1.
SW2 - Same as sample 22-028-SE2.

XRF ANALYSIS RESULTS

CRAWLEY CAMP
PA NO. 22-028

Mine Name: Crawley Camp PA# 22-028
XRF Field Analyses
Results in PPM

XRF SAMPLE I.D.	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Ni	Cu	Zn	As	Sr
22-028-SE500		4293.27	4922.79	699.464		7114.64	39271.5				1675.06	387.447	82.0731
22-028-WR1A	1488.79 *	40615.7	2233.98	1333.25			8608.51			95.7611 *	61.4512 *	224.679 *	67.1342
22-028-WR1B		22759.1	3905.54	2732.12			56607.5			150.059 *	177.269 *	559.718	132.58
22-028-WR1-COMP	1780.42 *	25220	2901.65	2116.25		1175.21 *	40485.9	561.514 *		129.509 *	138.24 *	393.889 *	99.3117
22-028-WR2A		26853.6	1864.1	926.93			34169.9			111.706 *	248.5 *	134.463 *	178.515
22-028-WR2B		34065.7	1389.63	1628.22			18533			91.549 *		161.363	100.227
22-028-WR2-COMP		26426.3	1826.1	1005.12			28354.3			95.9614 *	151.788 *		161.086

XRF SAMPLE I.D.	Zr	Hg	Mo	Pb	Rb	Cd	Sn	Sb	Ba	Ag	U	Th
22-028-SE500	28.8465 *			52.7664 *								
22-028-WR1A	241.998		16.6488 *	875.056	292.18			714.835	735.311			76.2495
22-028-WR1B	186.721		13.7501 *	1214.36	220.049			294.49	634.719			
22-028-WR1-COMP	209.27	67.596 *	10.2318 *	858.226	217.029			478.474	760.508			24.4272 *
22-028-WR2A	240.615		17.503 *	896.351	197.494			77.4789 *	1099.36			
22-028-WR2B	264.779		7.58732 *	824.526	275.397				781.824			
22-028-WR2-COMP	255.855			841.174	202.346				1016.94			

* = Estimated Quantity

$ = Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

CRAWLEY CAMP
PA NO. 22-028

AIMSS SCORESHEET

SITE NAME: Crawley Camp
PA NUMBER: 22-028

LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	7.022
6	GW - TARGETS	WELLS - 1 MI. x 2.5		12.5
7		WELLS - 1 TO 4 MI		35
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	47.5
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	133418
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		300
12		EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	700
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	7.755
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19		FISHERY		1
20		RECREATION		0
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	13
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	70571
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		5
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	25
27		LIKELIHOOD SCORE	LINES 25 + 26C	25
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.043
29	AIR - TARGETS	POPULATION - 4 MILES		30
30		NEAREST RESIDENCE		0
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	40
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	43
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		50
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	150
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.039
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		10
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		2
43		TARGETS SCORE	SUM LINES 40 THRU 42	12
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	70
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE	(LINES 10 + 24 + 35 + 44) / 100,000		2.04

SITE NAME: Crawley Camp
PA NUMBER: 22-028

SITE SAFETY

LINE NO.				
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	150
5		HAZ. STRUCTURES	40 EA.	80
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	230
9		POPULATION - 1 MILE		10
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		2
12		TARGETS SCORE	SUM LINES 9 THRU 11	12
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	55.20

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: CARMODY **PA#:** 22-337

Date: August 4, 1994 **Time:** 0910-1845

Field Team Leader: Flammang, Pioneer

Sampling Personnel: Clark, West; Pioneer

Visitors: Dick Juntunen, Representative for Santa Fe Mines
Several geologists

Weather/Seasonality Observations: Cloudy; drizzle on and off; breezy (10-15 mph); 65°-75°F.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #7: Shaft #1 facing east; #8: Shaft #2 facing west; #9: Adit #1 associated with WR-3 facing west; #10: Adit #2 associated with WR-4 facing west; #11: TP-2B facing west; #12: Mill building and collapsed vats facing southwest; #13: Facing north toward TP-1 (Note: Breach in dam); #14: Breach in dam below TP-3, east bank of Slaughterhouse Gulch; #15: Facing south down Elkhorn Creek and TP-4 from USFS picnic area. Video Tape No. 3

General Comments/Observations (not covered specifically in attached Inventory Forms): Four separate areas of treated wastes were identified on-site: two tailings ponds, one tailings pile immediately below collapsing vats, and one tailings pile spread out along Elkhorn Creek just below USFS picnic area. Town of Elkhorn attracts many tourists during the summer.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Pull TP-3 and TP-4 out of respective creeks. Isolate all tailings from direct contact with tourists by contouring, amendments and/or coversoil, and revegetation or disposal in a repository. Close open adits; consider covers on shafts. WR-3 and WR-4 are recontoured partially; revegetate WR-4 where undercut.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): CARMODY **PA#:** 22-337

Legal Description: **T** 6N **;R** 3W **;Sec.** 14 , SW **1/4** NW **1/4** ____ **1/4**

County: JEFFERSON **Mining District:** ELKHORN

Latitude: N 46° 16' 20" **Longitude:** W 111° 57' 05"

Primary Drainage Basin and Code: Elkhorn Creek/10020006
Secondary Drainage Basin: Slaughterhouse Gulch

USGS Quadrangle map name(s): Elkhorn

Mine Type/Commodities: Hardrock/Gold, Silver

Activity Status: **Active**___, **Inactive/Exploration** X , **Abandoned**___.

Ownership: Known Y X **N**___; **private/public?** Private
Owner, Agent, or Contact (Include address and phone when available)**:** Santa Fe Mines

Relationship to other mines/sites in the area/district: Site is one of the mines in the area owned by Santa Fe Mines. Located just upstream from the Elkhorn Creek Tailings site (22-502).

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? Possible preparation for mining by Santa Fe Mines. Shafts have been fenced.

General site features: Elevation 6200'-6600', **Slope** 5°-15° ,
Aspect Southeast to Southwest

Land use: Mining X , **Recreational** X , **Residential** X , **Urban**___,
Agricultural X , **Other(Specify)**

Area of disturbed/unvegetated lands? 13.5 **acre(s).**
Site Dimensions: 1,100 feet x 500 feet; 500 feet x 125 feet (TP-4)

Predominant vegetation types: Lodgepole pine, willows, grasses

Access: roads - good (paved)___, **poor (maintained dirt road)** X ,
4wd___, **trail**___.
Other logistical considerations (proximity to other sites). Just above Elkhorn Millsite, on road leading to Elkhorn and Iron Mines.

Well logs within 1 mile radius; (Attach MBMG Well Log Printout(s): There are 12 wells reported within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site lies on northwest side and in Slaughterhouse Gulch, which flows south into Elkhorn Creek between TP-3 and TP-4. Elkhorn Creek flows southwest through the site to confluence with the Boulder River approximately 10.5 miles downstream. Site is described in literature as being underlain by limestone.

Mining/milling history, ore type/tenor, host rock, gangue: Reported with a total output of 4,512 tons of ore, which yielded 238 ounces gold and 50 ounces silver in 1933 and 1934. Deposit is described in literature as fissure vein in limestone. The vein contains pyrite, arsenopyrite, and gold in a gangue of quartz and calcite.

Mine Operation?

Shafts - **Yes** X, **No**___, **#** 2, **Comment** Fenced, but open
Adits - **Yes** X, **No**___, **#** 2, **Comment** Open
Pits - **Yes** X, **No**___, **#** 3, **Comment** Near Shafts #2 and #3
Placers - **Yes**___, **No** X, **#** ___, **Comment**___
Other - **Yes**___, **No** X, **#** ___, **Comment**___

Mill Operation? **Yes** X, **No**___. **If yes answer the next three questions:**

Period(s) of Operation: In 1933, 6,000 tons of ore were milled by the cyanide process in a mill on the property.

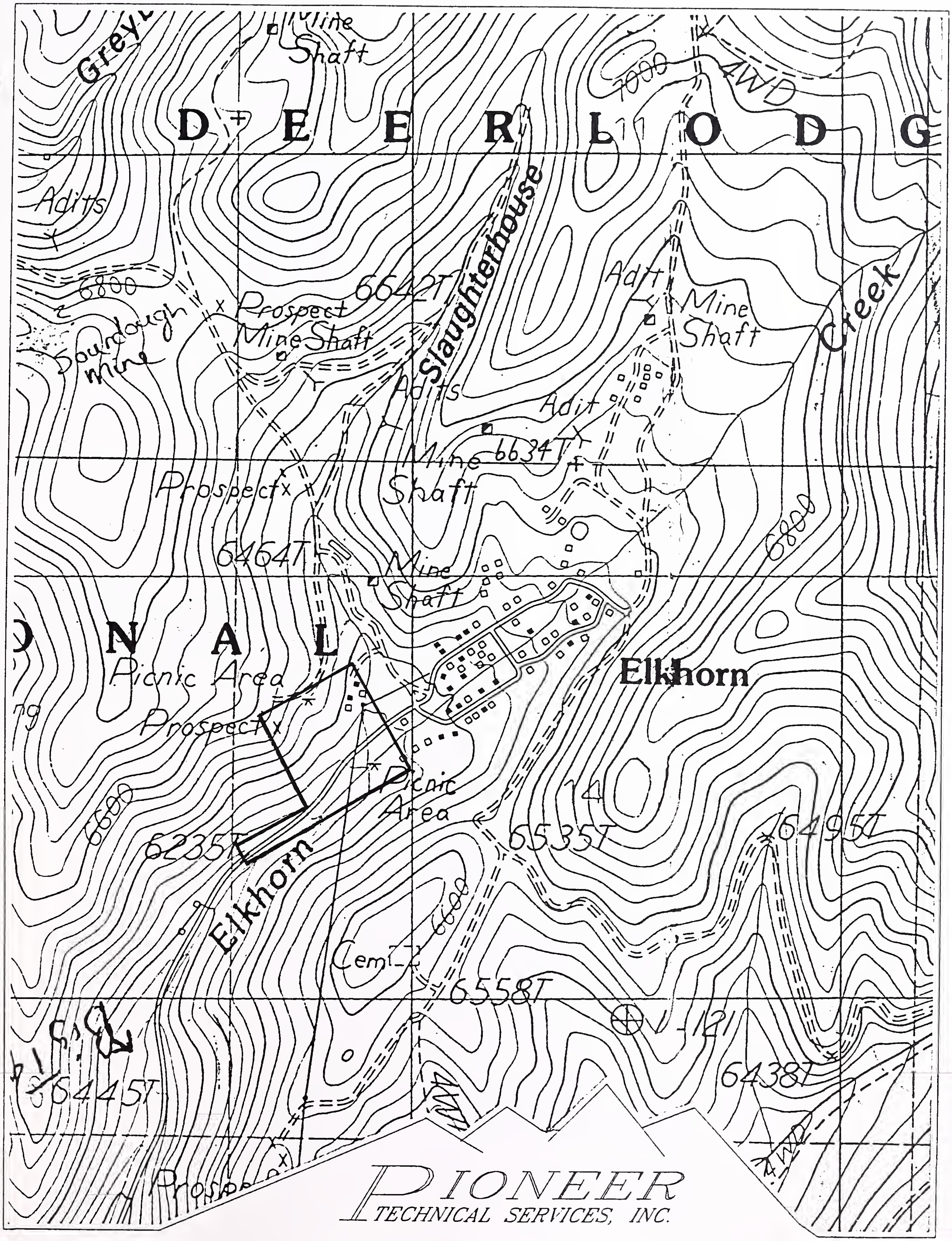
Origin of Ore Milled - Custom Mill___ **Dedicated Mill**___; **Number and names of mines that supplied mill feed:** Carmody; unknown

Process? Hg-amalgam, CN⁻ leach (vat, heap), floatation, smelting? Cyanide process - vat for TP-2; otherwise, unknown. Cyanide present in TP-1, TP-2, and TP-3 samples.

Montana Bureau of Mines and Geology
Water Well Log Data

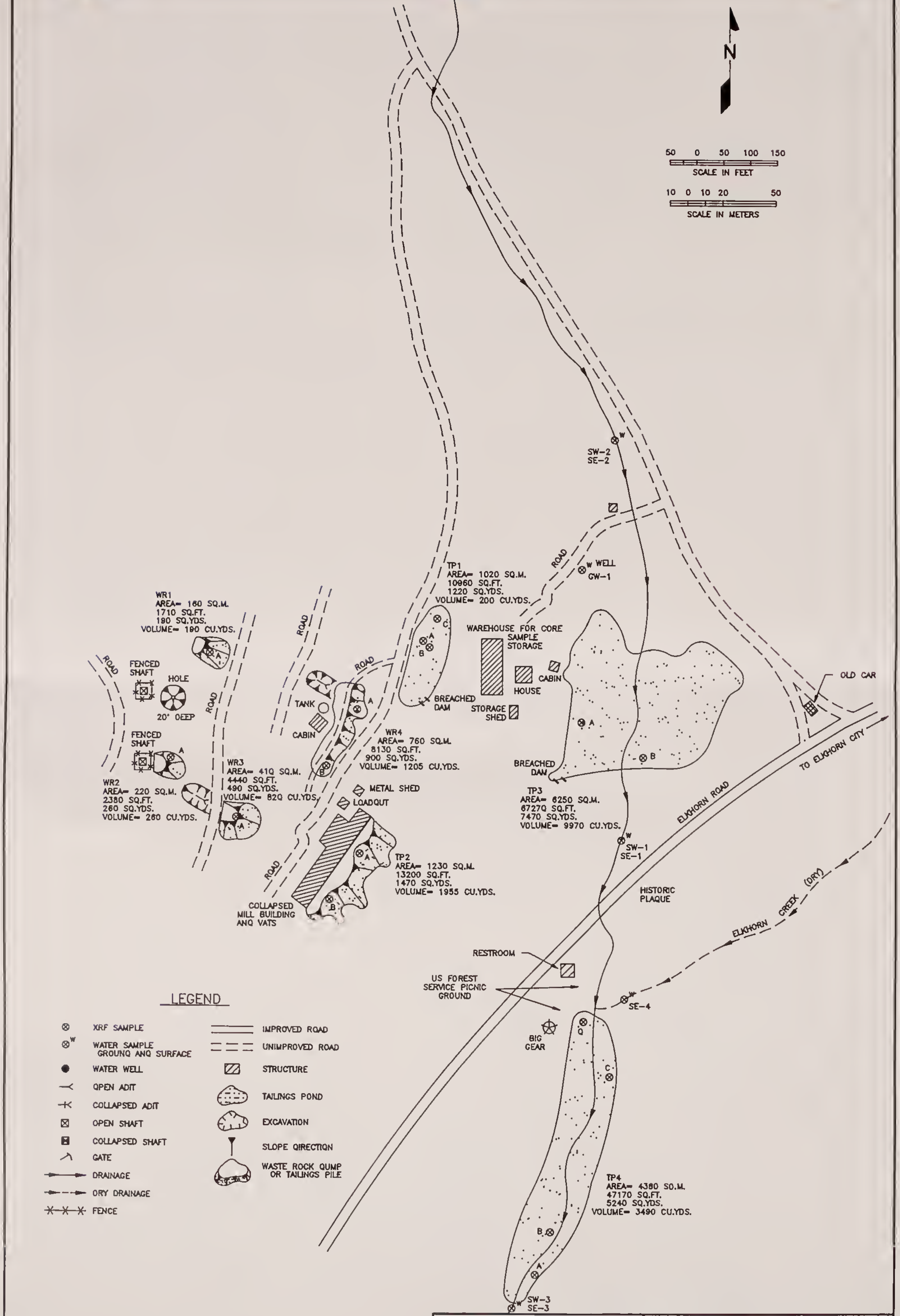
08/11/1994

Well No.	Location	Depth	Yield	Static Water Level
M:53335	06N 03W 11 CC	155.0	90.0	25.00
M:53336	06N 03W 11 CD	180.0	60.0	25.00
M:53337	06N 03W 14	110.0	20.0	20.00
M:53338	06N 03W 14 BA	185.0	99.0	170.00
M:53341	06N 03W 15	84.0	4.0	15.00
M:53339	06N 03W 15	125.0	20.0	5.00
M:53340	06N 03W 15	64.0	30.0	10.00
M:53342	06N 03W 15 DAC	27.0	1000.0	15.00
M:5401	06N 03W 22 ABB	18.0	0.0	6.47
M:5399	06N 03W 22 ABB	78.0	0.0	8.49
M:5400	06N 03W 22 ABB	18.0	0.0	6.97
M:5402	06N 03W 22 ABB	65.0	0.0	6.37



PIONEER
TECHNICAL SERVICES, INC.

CARMODY, P.A. NO. 22-337
T06N, P03W, SECTION 14
SCALE: 1" = 1000'



DRAWN FOR:
PIONEER
TECHNICAL SERVICES, INC.

TITLE:
CARMODY
PA#22-337

DRAWING NO.: PT340243 REV: -
DATE: 11/19/94 PLOT SCALE: 1 = 50

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. **Waste Characteristics** - *Use table on following page.*

Unique source identification: (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures/vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. **TAILINGS IMPOUNDMENTS** - *If tailings impoundments are also present, complete the following questions.*

Describe the tailings grain size distribution (approximate % sand, silt, & clay): TP-1 - 100% silt; TP-2 - 50% sand and pebbles, 25% clay, and 25% silt; TP-3 - 70% sand, 10% silt, and 20% clay; TP-4 - 100% sand.

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): TP-1 - No stratification, approx. 1/2 foot; TP-2 - approx. 4 feet, upper part of pile is sand and silt and lower part of pile is clayey silt; TP-3 - approx. 4.5 feet, grades from silt to sand to clay at bottom; TP-4 - No stratification noted, approx. 2 feet deep.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): TP-1 and TP-2 are dry. TP-3 and TP-4 are in floodplain and cut by creeks (partially wet).

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): TP-1 and TP-2 are breached impoundments. TP-4 may have a partial dam at base (mostly gone). TP-2 is a pile down hillside.

Comments on potential for mitigation: TP-1 and TP-2 - Grade, amend and/or coversoil, and revegetate; TP-3 - already revegetated, but may need to isolate from stream; TP-4 - isolate from stream, amend and/or coversoil, and revegetate.

SOURCE INVENTORY FORM

SAMPLERS: Flammang, West

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
TP-1A-1	TAIL	200	Northwest part of TP-1, borehole; 0-7", light tan silt	Breached Dam	5.4 (D)	0.04	22-337-TP-1	08/05/94 0742	T-Metals, ABA, Cyanide
TP-1B-1	TAIL		Northeast part of TP-1, borehole; 0-5", light tan silt	Breached Dam	5.4 (D)	0.03			
TP-1C-1	TAIL		Grab sample from pile in north part of TP-1	Breached Dam	4.2 (D)	0.04			
TP-2A-A	TAIL	1,955	North end of TP-2, east face; 0-8' down slope, orange fine-grained sand	None	5.6 (D)	0.03	22-337-TP-2	08/05/94 0745	T-Metals, ABA, Cyanide
TP-2A-B	TAIL		8-23' down slope, medium orange silt	None	6.55 (D)	0.035			
TP-2A-C	TAIL		23-33' down slope, orange-red silty clay	None	6.1 (D)	0.03			
TP-2B-A	TAIL		South end of TP-2, east face; 0-10' down slope, medium orange clayey silt	None	6.1 (D)	0.04			
TP-2B-B	TAIL		10-30' down slope, dark orange silty clay	None	6.35 (D)	0.03			
TP-3A	TAIL	9,970	Near center of west side of TP-3, 50' west of stream; 0-3', dark orange sand	Breached Dam	6.0 (D)	0.03	22-337-TP-3	08/05/94 0750	T-Metals, ABA, Cyanide
TP-3B-A	TAIL		Southeast corner of TP-3, approx. 40' east of creek, borehole; 0-9", medium brown silt	Breached Dam	6.1 (D)	0.045			
TP-3B-B	TAIL		9"-4',orange brown clayey sand	Breached Dam	5.9 (D)	0.04			
TP-3B-C	TAIL		4-6.5', dark brown-orange clay	Breached Dam	5.85 (D)	0.035			
TP-4A	TAIL	3,490	Southeast end of TP-4, 75' east of stream; 0-4', red-brown sand	Breached Dam	6.8 (D)	0.04	22-337-TP-4	08/05/94 075[illegible]	T-Metals, ABA, Cyanide
TP-4B	TAIL		Near south middle of TP-4, 10' west of stream; 0-1.5', medium orange sand	Breached Dam	6.25 (D)	0.03			
TP-4C	TAIL		Near north end of middle of TP-4, 10' east of creek; 0-1', orange sand	Breached Dam	6.8 (D)	0.02			
TP-4D	TAIL		Southwest end of TP-4, 30' west of creek, 0-27", red-brown sand	Breached Dam	7.0 (D)	0.03			
WR-1A	WR	190	East side, near top middle	None	6.3 (D)	0.025	22-337-WR-1	08/05/94 0800	T-Metals, ABA
WR-2A	WR	260	East side, near top middle	None	6.8 (D)	0.04			
WR-3A	WR	820	Middle of east face, near top	None	4.5 (D)	0.03			
WR-4A	WR	1,205	North end, near top of east face	None	6.0 (D)	0.03			
WR-4B	WR		South end, near top of east face	None	6.4 (D)	0.03			

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-337-TP-1 is composite of TP-1A-1, TP-1B-1, and TP-1C-1. 22-337-TP-2 is composite of TP-2A-A through -2A-C, and TP-2B-A and -2B-B. 22-337-TP-3 is composite of TP-3A, and TP-3B-A through -3B-C. 22-337-TP-4 is composite of TP-4A through -4D. 22-337-WR-1 is composite of WR-1A through WR-4B. See Trumley Heap Leach (22-501) for background soil sample.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes____, No_X_, Number:____ Identification:__________

Filled shafts: Yes____, No_X_, Number:____ Identification:__________

Seeps/Springs: Yes____, No_X_, Number:____ Identification:__________

Groundwater wells within 4 miles?: Yes_X_, No____;
Number of well logs:_16_

Distance to nearest well used for drinking:
_X_<1,000 ft;___1,000 ft to 0.5 miles;___>0.5 miles.

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable____, Possible_X_, Unlikely____.
Uncontained sources containing elevated metals; TP-3 and TP-4 may be in contact with shallow alluvial aquifer.

Approximate Depth to Groundwater:_X_<25 ft;___ 25 - 100 ft;___ >100 ft.

Other observations/notes: Upper sources (TP-1, TP-2 and waste rock) are further from groundwater up on hillside above Elkhorn Creek; shafts approximately 30 feet deep contain no water.

GROUNDWATER INVENTORY FORM

SAMPLERS: Clark, West

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC $\mu S/cm$ @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
GW-1	RW	Well located possibly downgradient of TP-1 and upgradient of rest; outside faucet on pump	N/A	7.15	336	172.5	8.4	133	UNK	22-337-GW-1	08/04/94 1415	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3, Cyanide

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): Water was allowed to flow approximately 20 minutes before sampling (unknown depth of well).

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No ____, **Name(s):** Slaughterhouse Gulch; Elkhorn Creek

Dry streambeds: Yes X, No ____, **Name(s):** Elkhorn Creek above confluence with Slaughterhouse Gulch

Other surface water: Yes ____, No X, **Name(s)/Description:** ____

Waste materials within any floodplain: Yes X, No ____ **Source ID(s):** TP-3 and TP-4

Approximate Flood frequency? X 1 yr, ___ 10 yr, ___ 100 yr

Estimated seasonal flow of stream(s) (cfs/gpm)? 0.36 cfs
High Flow: 4.5 cfs, **Average Flow:** 0.45 cfs

Distance between waste source(s) and nearest surface water body (ft)? TP-1 is approx. 250 feet; TP-2 is approx. 400 feet; TP-3 is 0 feet; TP-4 is 0 feet; and, waste rock is approx. 500+ feet.

Surface water draining onto or through waste sources: Yes X, No ____,
Describe: Slaughterhouse Gulch cuts TP-3; Elkhorn Creek cuts TP-4.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?) Agriculture, irrigation, wetlands, fishery.

Observed erosional/sedimentation/stream turbidity problems? Yes X, No ____. **Distance downstream (ft)?** 0-500 ___; 500-1,000 ___; >1,000 X. **Describe/explain** (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Tailings present in sediments between SW-1 and SW-3; SW-3 was taken just above another mill which tailings appeared to have contributed to the creek.

SURFACE WATER INVENTORY FORM

SAMPLERS: Clark

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	Downstream; below TP-3 dam and above Elkhorn Road in Slaughterhouse Gulch	8.85	229	15.2	NM	0.36 cfs (M)	22-337-SW-1	08/04/94 1450	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3, Cyanide
SE-1	SE	Downstream; below TP-3 dam and above Elkhorn Road in Slaughterhouse Gulch	N/A	N/A	N/A	N/A	N/A	22-337-SE-1	08/04/94 1450	T-Metals
SW-2	SW	Upgradient; 150' above Residence's Road in Slaughterhouse Gulch	9.07	255	15.2	121	0.35 cfs (M)	22-337-SW-2	08/04/94 1430	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3, Cyanide
SE-2	SE	Upgradient; 150' above Residence's Road in Slaughterhouse Gulch	N/A	N/A	N/A	N/A	N/A	22-337-SE-2	08/04/94 1430	T-Metals
SW-3	SW	Downstream; below TP-4 on Elkhorn Creek and above next mill building	6.55	229	16.0	118	0.36 cfs (M)	22-337-SW-3	08/04/94 1715	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3, Cyanide
SE-3	SE	Downstream; below TP-4 on Elkhorn Creek and above next mill building	N/A	N/A	N/A	N/A	N/A	22-337-SE-3	08/04/94 1715	T-Metals
SE-4	SE	In Elkhorn Creek upstream of confluence with Slaughterhouse Gulch	N/A	N/A	N/A	N/A	N/A	22-337-SE-4	08/04/94 1745	T-Metals

*FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): NM = Not Measured

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides? (SO_3)

Presence of evaporative salt deposits? *(ESD)*

Discolored or turbid seepage? *(SPG)*

Presence of long filamentous algae in drainages, mosses in moist areas?

Presence of ferric hydroxide precipitates? *(FEOX)*

Presence of burned or stressed vegetation? *(VEG)*

pH ≤ 5.0 *(pH)*

General Potential for AMD Mitigation:

Area available for treatment (acres)? Approx. 10 acres at location of TP-3 and TP-4

Wetlands present: Yes X **, No**___**, Describe:** Streamside

Carbonate rocks/soils: Yes X **, No**___**, Describe:** Host rock is described in literature as limestone.

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; **10-30** X ; **30-100**___; **100-300**___; **300-1,000**___; **1,000-3,000**___; **3,000-10,000**___; **10,000 or greater**___; **Comments**

Nearest residence: X **<1,000 ft;**___**1,000 ft - 0.5 miles;**___**>0.5 miles.**
(Possibly summer residence only)

For each source (table next page):

Available fine materials? *Surface area?*

Uncovered and unvegetated? *Wet or dry?*

Overall dust propagation potential:
observed *high* *moderate* *low* *none*

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Flammang, West

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
WR-1	FEOX	Dry	1,710	1,370	Yes	Low
WR-2	FEOX	Dry	2,380	2,140	Yes	None
WR-3	pH; SO3; FEOX	Dry	4,440	4,440	Yes	Low
WR-4	FEOX; SO3	Dry	8,130	7,725	Yes	Low
TP-1	pH	Dry	10,960	9,865	Yes	Moderate/Low
TP-2	FEOX; ESD	Dry	13,200	11,880	Yes	Low
TP-3	None	Partial	67,270	0	Yes	None
TP-4	None	Partial	47,170	23,585	Yes	Moderate/Low

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes_X_, **No**____
Describe:_ Core shed used occasionally just below TP-1 and just abov TP-2; recreational cabin 200-300' east of TP-3 and 200' north of TP-4._

Population within 1 mile: 1-10___; **10-30**_X_; **30-100**___; **100-300**___; **300-1,000**___; **1,000-3,000**___; **3,000-10,000**___; **10,000 or greater**___.

Evidence of recreational use on site: Yes_X_, **No**___, **Describe:**_ USFS picnic area on north end of TP-4 (across road from TP-3); site is located across from a historical marker for the town of Elkhorn._

Accessibility (check each that apply):_X_ **Easily accessible - no fences, gates, or warning signs;**___**Moderately Accessible - barbed wire fences, road gated, or signs posted;**___**Difficult Access - chain-link fence, road gated and locked, site guarded (does not include locked or manned access points located more than 0.5 miles from the actual site).**

Sensitive environments on-site or adjacent to site:
State or National Parks - Yes___, **No**_X_, **Comment**____________
Wilderness Area - Yes___, **No**_X_, **Comment**____________
T&E Species Habitat - Yes___, **No**_X_, **Comment**____________
Bat Habitat - Yes___, **No**_X_, **Comment**_ Possible, open adits_

Primary Drainage_X_; **Secondary Drainage**___; **No Information**___:
- **Riparian Habitat Quality - High**___, **Medium**_X_, **Low**___
- **Wetlands Frontage - High**___, **Medium**_X_, **Low**___
- **Fisheries Habitat and Species Classification -** _4_
- **Sport Fishery Classification -** _4_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, **No**___, **Number**_4_, **types and locations:**___ _Two fenced, but open shafts associated with WR-2; two open adits associated with WR-3 and WR-4._

Hazardous structures: Yes_X_, **No**___, **Number**_5_, **types and locations:**_ _Hazardous workshed on WR-4; mill; loadout; metal building; and collapsing vats on TP-2._

Unstable highwalls, pits, trenches, slopes: Yes_X_, **No**___, **Number**_3_, **types and locations:**_ Three large pits by Shafts #1 and #2 approx. 10 feet deep._

Unstable waste piles, impoundments, undercut banks: Yes_X_, **No**____, **Number**_3_, **types and locations:**_ TP-2 is steep, unvegetated; impoundment on TP-1 is steep, unvegetated; part of WR-4 is undercut for road construction._

Fire and/or Explosion hazards: Yes___, **No**_X_, **Explain:**____________

Bibliography

MBMG, Mines and Mineral Deposits (Except Fuels), Jefferson County, Montana, Bulletin 16, Written by R.N. Roby, W.C. Ackerman, F.B. Fulkerson, and F.A. Crowley, June 1960.

MBMG, Well Log Database, July 14, 1994.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Carmody, Prepared by Northern Engineering and Testing, October 12, 1988.

USGS, Topographic Map, Elkhorn, Montana, 7 1/2 minute Quadrangle, 1985.

LABORATORY ANALYTICAL DATA

CARMODY
PA NO. 22-337

Carmody PA# 22-337
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - FLAMMANG
INVESTIGATION DATE: 08/04/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-337-SE1	1.4 U	377	66.2	4.5	23.4 J	12.2	425	69400	0.20	682 JX	11.1	60.5	16.8 UJ	293	NR
22-337-SE2	0.8 U	73.7	51.2	1.3	7.7 J	4.7	112	21200	0.16	407 JX	4.9	31.7	9.3 UJ	67.0	NR
22-337-SE3	59.5 J	110	28.1	14.8	4.1 J	4.9	289	13600	72.0	267 JX	4.1	2410	205 J	6400	NR
22-337-SE4	22.5 J	57.1	46.9	19.3	6.7 J	13.6	110	16300	23.4	430 JX	14.0	1110	45.6 J	2060	NR
22-337-TP1	88.1 J	272	15	175	4.5 J	2.3	494	11600	7.53	2340 JX	6.1	5540	487 J	14700	4.704
22-337-TP2	1.7 J	448	223	6.4	18.7 J	38.1	1070	108000	0.10	285 JX	19.2	25.6	10.3 UJ	278	0.378
22-337-TP3	1.8 J	841	64.5	5.1	52.7 J	17.4	1210	95500	0.40	1210 JX	16.9	32.7	11.9 UJ	618	3.075
22-337-TP4	75.9 J	368	40.1	88.9	1.9 J	3.8	1250	16800	138	850 JX	5.5	13100	1170 J	29500	<0.285
22-337-WR1	1.7 J	1560	143	6.6	11.7 J	43.6	616	138000	1.00	434 JX	12.9	53.5	10.3 UJ	145	NR
BACKGROUND	0.5 U	21.3	267	0.5 U	9.3 J	15.0	13.9	17400	0.05	1410	11.1	17.7	5.8 UJ	85.8 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-337-TP1	<0.01	0.00	196	196	<0.01	0.10	0.03	3.12	193
22-337-TP2	1.64	51.2	1.02	-50	1.50	0.09	0.05	2.81	-1.80
22-337-TP3	0.12	3.75	77.5	73.8	0.05	0.04	0.03	1.25	76.3
22-337-TP4	0.07	2.19	118	116	0.05	<0.01	0.02	0.00	118
22-337-WR1	1.79	55.9	-0.82	-57	1.73	0.01	0.05	0.31	-1.13

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-337-GW1	0.12 U	5.2	5.5	4.0 U	8.4 U	6.8 U	5.9 U	53.7	0.13 JX	2.3 U	14.4 U	0.4 U	51.6 U	17.8	176
22-337-SW1	0.12 U	11.9	14.1	4.0 U	8.4 U	6.8 U	17.6	1420	0.08 UX	38.0	15.7	2.4	51.6 U	19.8	126
22-337-SW2	0.12 U	8.0	11.2	4.0 U	8.4 U	6.8 U	7.9	402	0.17 JX	21.4	14.4 U	0.9	51.6 U	15.6 U	125
22-337-SW3	0.23	11.4	12.7	4.2	8.4 U	6.8 U	10.0	481	0.29 JX	17.3	20.2	21.3	51.6 U	49.2	129

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-337-GW1	184	<5.0	37	0.28	<0.005
22-337-SW1	98	<5.0	8.0	<0.05	<0.005
22-337-SW2	111	<5.0	8.0	<0.05	<0.005
22-337-SW3	114	<5.0	8.0	<0.05	<0.005

LEGEND

SE2 - Upgradient in Slaughterhouse Gulch; 150' above residence.
SE3 - Downgradient; below TP4 on Elkhorn Creek and above next mill building.
SE4 - In Elkhorn Creek upgradient of confluence with Slaughterhouse Gulch.
TP1 - Composite of subsamples TP1A-1, 1B-1, and 1C-1.
TP2 - Composite of subsamples TP2A-A through 2A-C and TP2B-A and 2B-B.
TP3 - Composite of subsamples TP3A, TP3B-A through 3B-C.
TP4 - Composite of subsamples TP4A through 4D.
WR1 - Composite of subsamples WR1A through 4B.

GW1 - Well located possibly downgradient of TP1 & upgradient of the [illegible]; outside faucet on pump.
SW1 - Same as sample 22-337-SE1.
SW2 - Same as sample 22-337-SE2.
SW3 - Same as sample 22-337-SE3.

XRF ANALYSIS RESULTS

CARMODY
PA NO. 22-337

Mine Name: Carmody PA# 22-337
XRF Field Analyses
Results in PPM

XRF SAMPLE I.D.	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Ni	Cu	Zn	As	Sr
22-337-TP1A		8591.45	136712	224.806 *		3188.14	10332.2			454.936	11883.7		65.9454
22-337-TP1B		7956.52	112204			2753.07	13626.2	371.418 *		387.603	11772.9		58.6405
22-337-TP1C		9729.6	128242	271.461 *		3334.7	11102			518.677	13863.3		57.6572
22-337-TP1-COMP		11056.9	145013	286.957 *		3106.67	11977.8			459.186	13889.7		82.7887
22-337-TP2AA		25930.2	28450.8	1385.3		1710.93 *	123373	1703.39 *		826.046	566.475	334.96	92.9819
22-337-TP2AB		20014.6	29898.9	1452.53		1232.69 *	118098	1285.35 *		1035.11	438.949	758.827	127.201
22-337-TP2AC		25035.8	25138.4	1780.24		1063.12 *	130091	1110.09 *		1073.68	126.731 *	256.654 *	108.189
22-337-TP2BA		23107.7	23892.4	1657.97		794.908 *	131296	1158.92 *		961.482	167.873 *	582.632	117.391
22-337-TP2BB		24056.6	27353.3	1445.28		1336.57 *	126557	1209.5 *		907.166	133.638 *	369.114	83.3338
22-337-TP2-COMP		24444.1	27272.2	1454.79		930.445 *	131516			996.816	200.328 *	545.832	104.007
22-337-TP3A		11750	46695.9	2019.76		3001.5 *	173019			864.973	601.543	1273.71	114.557
22-337-TP3BA		15291.5	54531.1	2347.94		1973.52 *	143180			2461.48	219.194 *	582.183	169.688
22-337-TP3BB		9384.38	69288.1	1477.08		2857.73 *	189372	1369.83 *		894.371	576.951	1278.42	111.675
22-337-TP3BC		9945.29	68774.1	1770.23		2738.57 *	177696	1489.26 *		735.064	563.539	1380.16	121.823
22-337-TP3-COMP		10735.6	57444.4	1763.82		2923.17 *	170489	1155.22 *		1140.12	461.599 *	1224.27	125.405
22-337-TP4A		2739.21	69942.9	400.147 *		3855.94	29580.7			2202.77	44887.6		43.011 *
22-337-TP4B		4484.82	26500.9	375.433 *		622.613 *	23320.7	512.648 *		1220.43	31859		51.804 *
22-337-TP4C		3535.37	11210.8	277.434 *			17715.6	481.282 *	102.891 *	569.144	12111.8		23.9465 *
22-337-TP4D		5578.15	23815.8	434.267 *		788.18 *	17563.6			879.385	20623.6		43.3372 *
22-337-TP4-COMP		6511.36	35331.8	496.167 *		711.226 *	19910.3			944.466	20666.6		53.8353 *
22-337-WR1A		17101.8	19498.9	1875.8		1900.76 *	114002	1137.56 *		934.274	117.616 *	946.455	157.952
22-337-WR1-COMP		26811.8	12813.4	1663.21		1072.38 *	120155	1456.58 *		441.379 *	205.434 *	2421.7	88.8124
22-337-WR2A		35582.9	7260.07	2405.93		910.394 *	63415.3			204.802 *		241.084 *	253.371
22-337-WR3A		35212	14360.6	1809.48		1039.24 *	137072	1280.64 *		625.872		1083.47	20.7004 *
22-337-WR4A		20773.5	20918.1	1148.95		1306.81 *	168470	1092.02 *		540.338		351.635	70.7516
22-337-WR4B		29232.1	9105.37	1567.43		1050.05 *	137149	1363.39 *		392.708 *	410.455 *	4979.89	36.8431 *

XRF SAMPLE I.D.	Zr	Hg	Mo	Pb	Rb	Cd	Sn	Sb	Ba	Ag	U	Th
22-337-TP1A	60.9685			4222.55	39.899 *	223.861 *		1101.86				21.2762 *
22-337-TP1B	53.9922			3809.6	26.7596 *	129.85 *		878.645		135.395 *		
22-337-TP1C	66.5199			4690.46	40.7276 *	206.17 *		1238.99				
22-337-TP1-COMP	61.7617			4856.42	44.9534 *	344.809 *		1387.77		188.653 *		22.6037 *
22-337-TP2AA	108.97				155.12				255.316			
22-337-TP2AB	99.3651				119.104				167.065			
22-337-TP2AC	118.387				155.896				247.706			
22-337-TP2BA	111.146				144.902				177.79			
22-337-TP2BB	93.7109				130.281				178.779			10.6032 *
22-337-TP2-COMP	108.396				122.465				199.233			9.56123 *
22-337-TP3A	127.25					252.953 *			125.459 *		19.6869 *	16.7761 *
22-337-TP3BA	163.433		13.835 *		61.9286 *				246.358		17.3561 *	11.3489 *
22-337-TP3BB	100.274								85.0656 *	167.963 *	12.4617 *	11.1727 *
22-337-TP3BC	92.8929								70.9534 *		11.3914 *	12.8925 *
22-337-TP3-COMP	112.776								95.6867 *		11.0286 *	14.4102 *
22-337-TP4A	95.9406	166.875 *		7227.3		386.222 *		2996.5		386.634 *		
22-337-TP4B	77.284	178.389 *		15430.1	37.5032 *	239.732 *		3829.51		343.923 *		
22-337-TP4C	44.0352			6696.49	31.0119 *			2459.49		217.931 *		43.0839 *
22-337-TP4D	74.8198			6297.28	30.0295 *			2086.17		163.994 *		36.7743 *
22-337-TP4-COMP	79.1478	188.774 *		6751.64	47.5328 *	220.821 *		2379.02		231.078 *		45.3517 *
22-337-WR1A	154.132				84.65 *				170.864			9.16764 *
22-337-WR1-COMP	240.002				177.724				294.05			
22-337-WR2A	765.344				148.78				723.338			27.7211 *
22-337-WR3A	106.632				194.126				198.492			
22-337-WR4A	100.767				176.579				120.014 *			
22-337-WR4B	93.0932				207.159				165.66 *	130.047 *		13.8747 *

* = Estimated Quantity

$ = Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

CARMODY
PA NO. 22-337

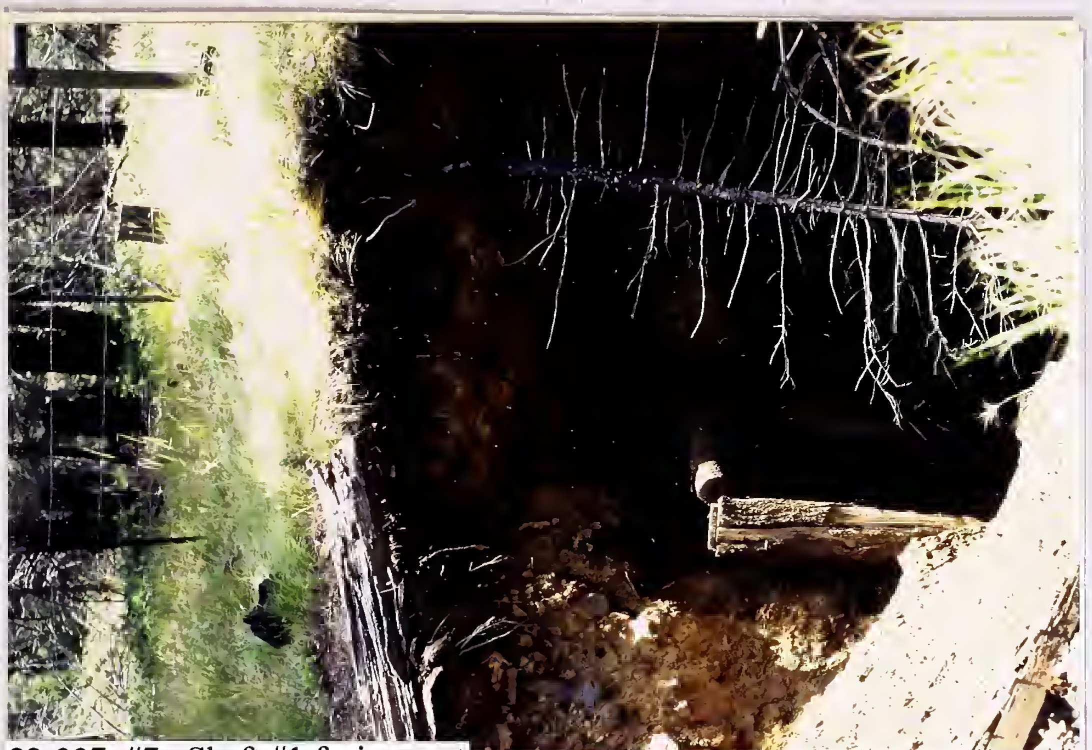
AIMSS SCORESHEET

SITE NAME: Carmody
PA NUMBER: 22-337

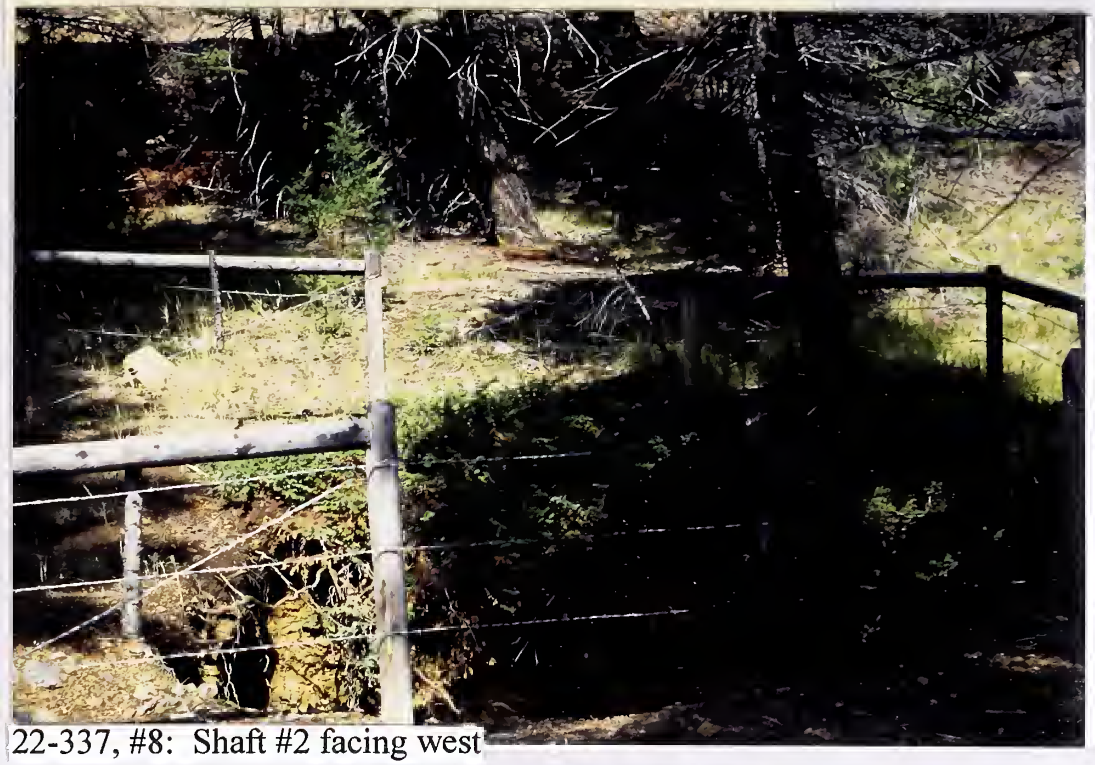
LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	49.824
6	GW - TARGETS	WELLS - 1 MI. x 2.5		30.0
7		WELLS - 1 TO 4 MI		4
8		NEAREST WELL		10
9		TARGETS SCORE	LINES 6 + 7 + 8	44.0
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	876902
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		300
12		EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	700
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	55.194
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		1
18		WETLANDS		10
19		FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	19
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	734080
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		5
26B		DISTANCE TO POPULATION		20
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	100
27		LIKELIHOOD SCORE	LINES 25 + 26C	100
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.951
29	AIR - TARGETS	POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		10
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	30
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	5853
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		250
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		20
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	400
38		LIKELIHOOD SCORE	LINES 36 + 37C	650
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.758
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		10
41		NEAREST RESIDENCE		10
42		RECREATIONAL USE		10
43		TARGETS SCORE	SUM LINES 40 THRU 42	30
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	34281
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE (LINES 10 + 24 + 35 + 44) / 100,000			16.51

SITE NAME: Carmody
PA NUMBER: 22-337

LINE NO.		SITE SAFETY		
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	200
3		OPEN ADITS	50 EA.	100
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	225
5		HAZ. STRUCTURES	40 EA.	200
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	725
9		POPULATION - 1 MILE		10
10	TARGETS	NEAREST RESIDENCE		10
11		RECREATIONAL USE		10
12		TARGETS SCORE	SUM LINES 9 THRU 11	30
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	435.00

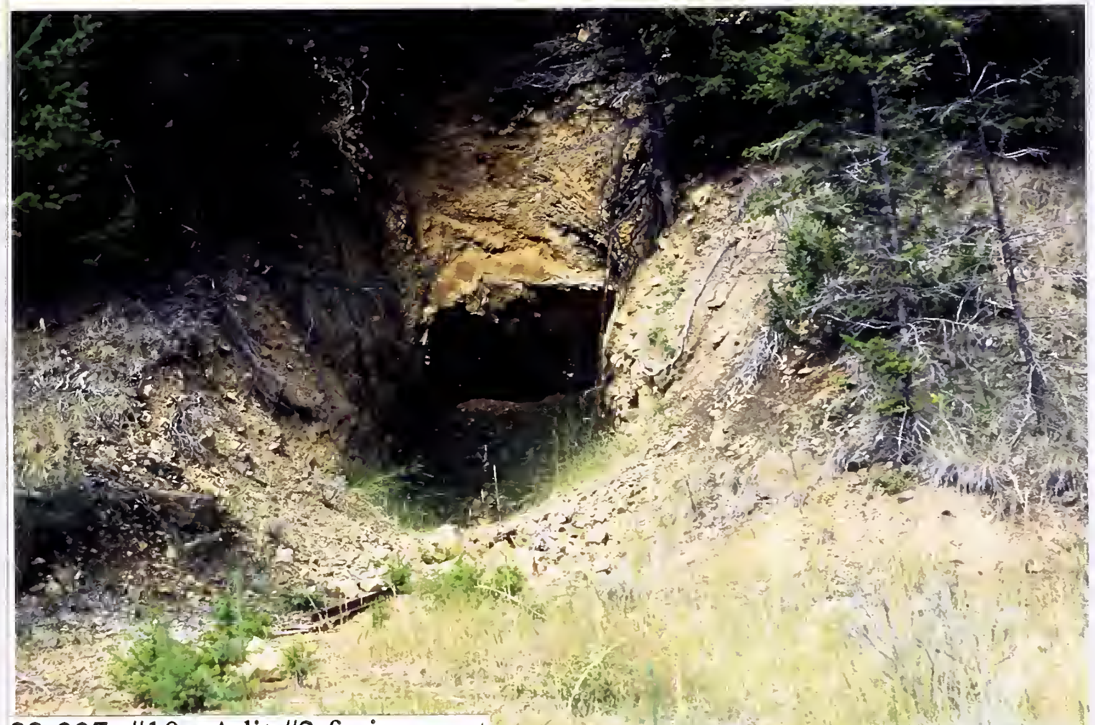


22-337, #7: Shaft #1 facing east

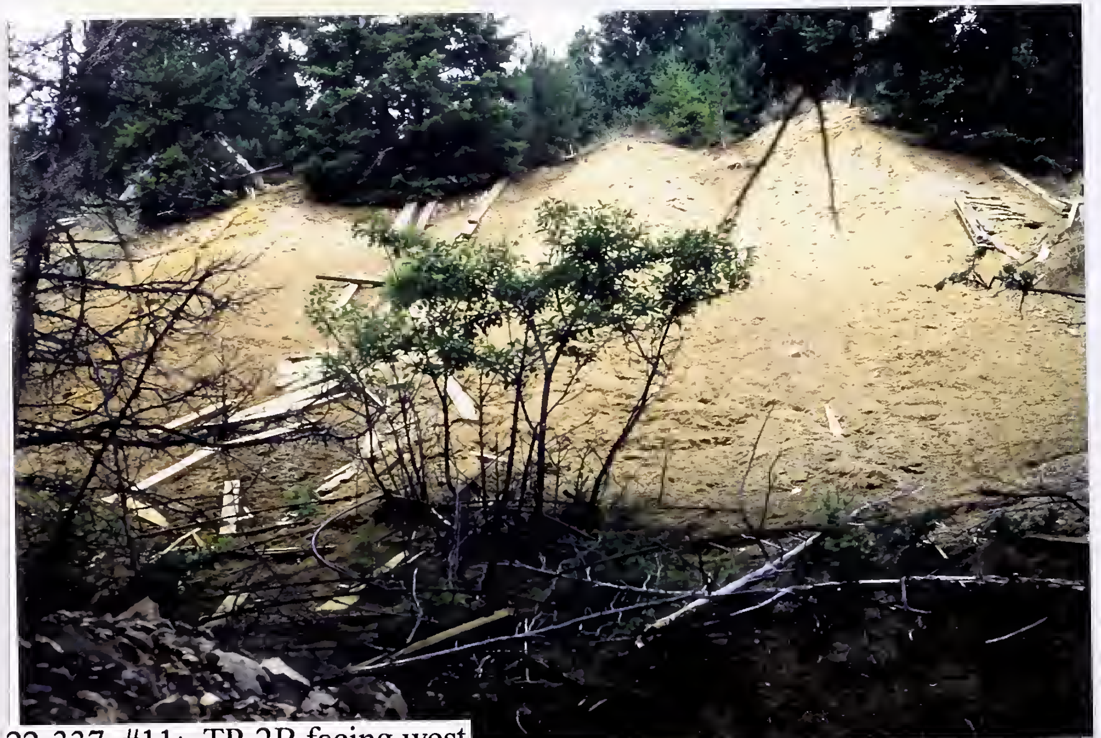


22-337, #8: Shaft #2 facing west

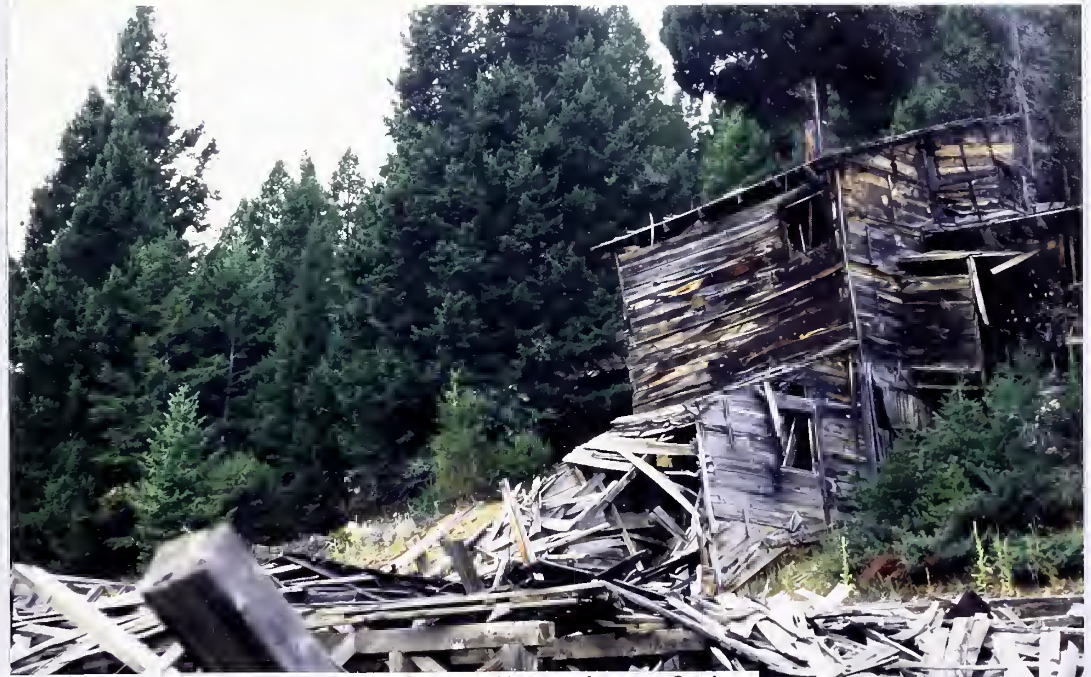
22-337, #9: Adit #1 facing west



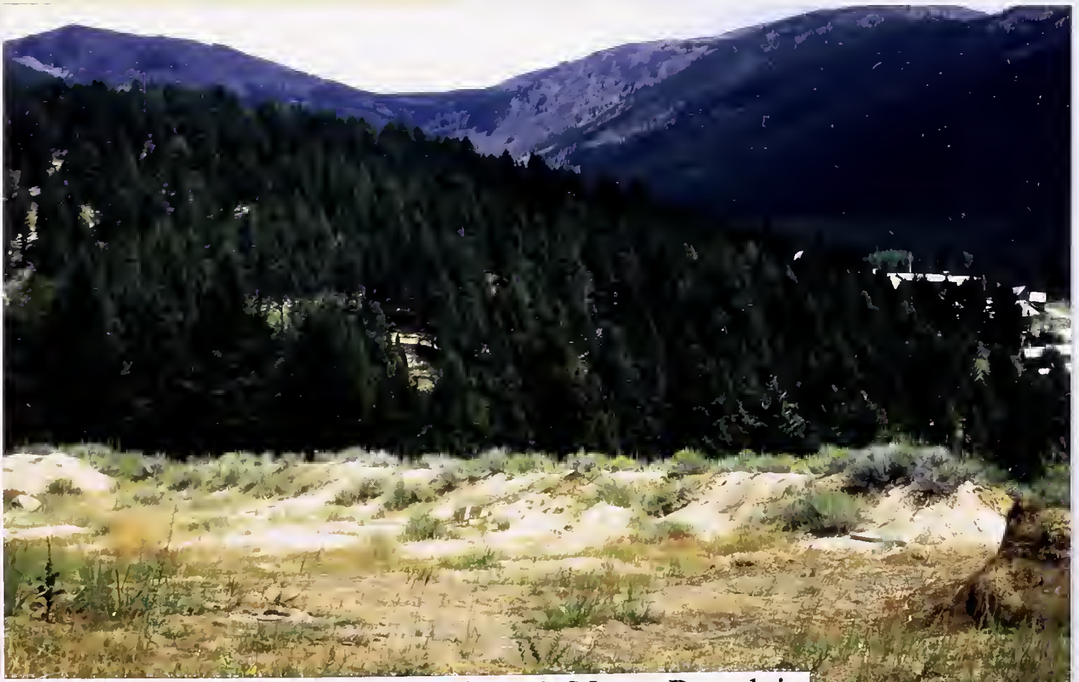
22-337, #10: Adit #2 facing west



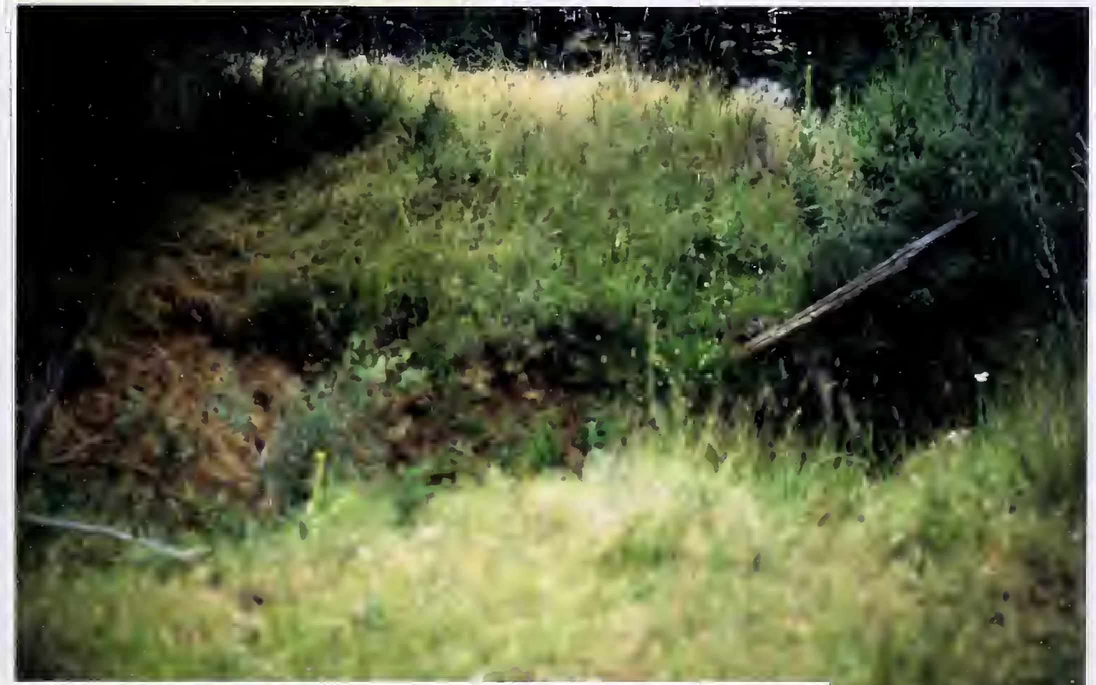
22-337, #11: TP-2B facing west



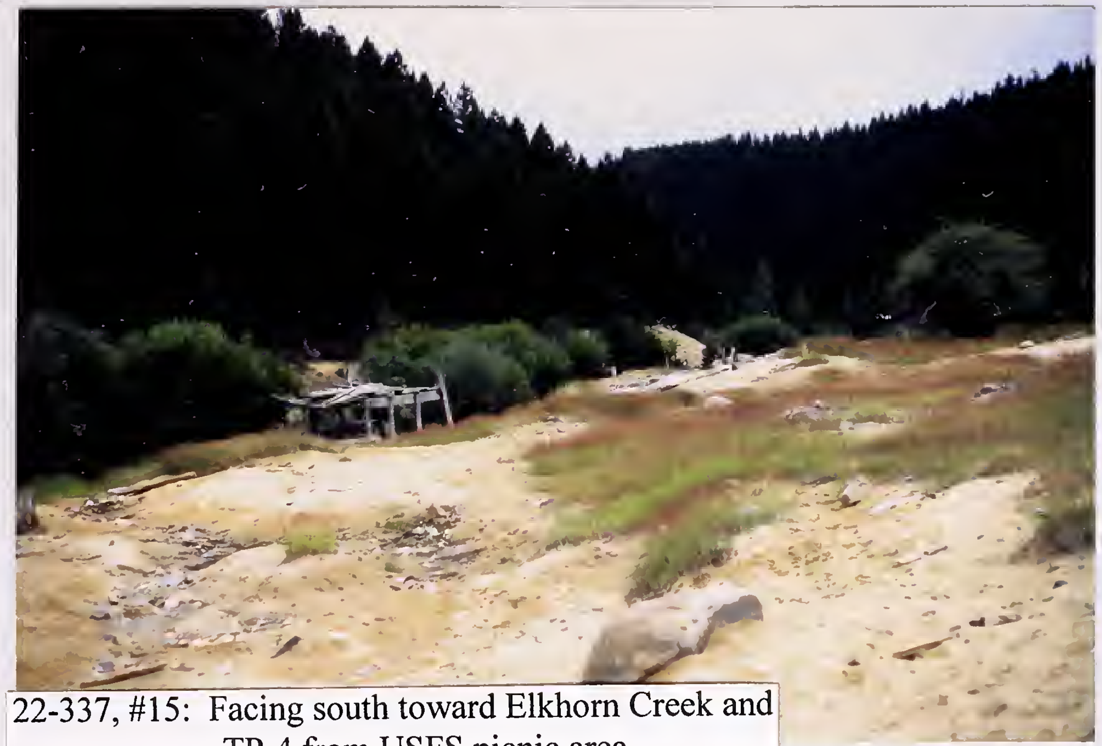
22-337, #12: Mill building and collapsed vats facing southwest



22-337, #13: Facing north toward TP-1 (Note: Breach in dam)



22-337, #14: Breach in dam below TP-3 and east bank of Slaughterhouse Gulch



22-337, #15: Facing south toward Elkhorn Creek and TP-4 from USFS picnic area

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: IRON **PA#:** 22-359

Date: August 9, 1994 **Time:** 1200-1600

Field Team Leader: Flammang, Pioneer

Sampling Personnel: Belanger, West; Pioneer

Visitors: None

Weather/Seasonality Observations: Sunny; hot (80°-90°F); slight breeze (5 mph); very dry.

Photographic Log **(Film Roll and Photo No.'s/Video Tape Number):** #17: AD-1 sample location facing south; #18: WR-3 and standing loadout (background) facing south; #19: WR-5; #20: Facing west from WR-5 toward WR-1 (background), WR-2, WR-3, and WR-4; #21: Uppermost sloughing adit associated with WR-5 facing south; #22: WR-4, WR-4B sample location, and loadout (right); #23: Drainage area where discharge from Adit #1 flows and stains red, below road facing south.
Video Tape No. 3

General Comments/Observations **(not covered specifically in attached Inventory Forms):**
N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Isolate WR-3 and WR-4 from the adit discharge; recontour, apply coversoil or amendments to low pH dumps, and revegetate. WR-1 may be too steep, but particularly WR-5 in the area of the trail and WR-3 and WR-4 near campsites.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): IRON **PA#:** 22-359

Legal Description: **T** 7N **;R** 3W **;Sec.** 36 **,** SW **1/4** SW **1/4** ____ **1/4**

County: JEFFERSON **Mining District:** ELKHORN

Latitude: N 46° 18' 37" **Longitude:** W 111° 55' 43"

Primary Drainage Basin and Code: Muskrat Creek/10020006
Secondary Drainage Basin: Muskrat Creek

USGS Quadrangle map name(s): Elkhorn

Mine Type/Commodities: Hardrock/Iron

Activity Status: **Active** ___, **Inactive/Exploration** ___, **Abandoned** X .

Ownership: Known Y ___ **N** X ; **private/public?** Private
Owner, Agent, or Contact (Include address and phone when available)**:** Unknown

Relationship to other mines/sites in the area/district: N/A

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? N/A

General site features: Elevation 8400'-8700', **Slope** 30°-35°,
Aspect North

Land use: Mining ___, **Recreational** X , **Residential** ___, **Urban** ___,
Agricultural ___, **Other(Specify)** ___

Area of disturbed/unvegetated lands? 8.5 **acre(s).**
Site Dimensions: 900 feet x 400 feet

Predominant vegetation types: Douglas fir, Engelmann spruce

Access: roads - good (paved) ___, **poor (maintained dirt road)** ___,
4wd X , **trail** ___.
Other logistical considerations (proximity to other sites). Road is very bad and should be considered a jeep trail or ATV trail. Road is posted as closed by USFS approx. 1/4 mile from the mine.

Well logs within 1 mile radius; (Attach MBMG Well Log Printout(s): There are 2 wells reported within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site is underlain by limestone, andesite and alaskite. Site lies in headwater area of Muskrat Creek. Water leaving the site would flow north to confluence with Muskrat Creek 3/4 mile away. Water would then flow west and then south to Boulder River 12 to 13 miles away.

Mining/milling history, ore type/tenor, host rock, gangue: First production was in 1890. Mined from 1890 to 1900 and 1904 to 1910; mined in 1900's for smelter flux because of high silica content. Deposit described in literature as hematite and limonite in a vein in limestone.

Mine Operation?
Shafts - **Yes**____, **No** X, **#** ____, **Comment**
Adits - **Yes** X, **No**____, **#** 7, **Comment** All collapsed
Pits - **Yes**____, **No** X, **#** ____, **Comment**
Placers - **Yes**____, **No** X, **#** ____, **Comment**
Other - **Yes** X, **No**____, **#** 2, **Comment** Open cuts; 10' highwall

Mill Operation? **Yes**____, **No** X. **If yes answer the next three questions:**

Period(s) of Operation: N/A

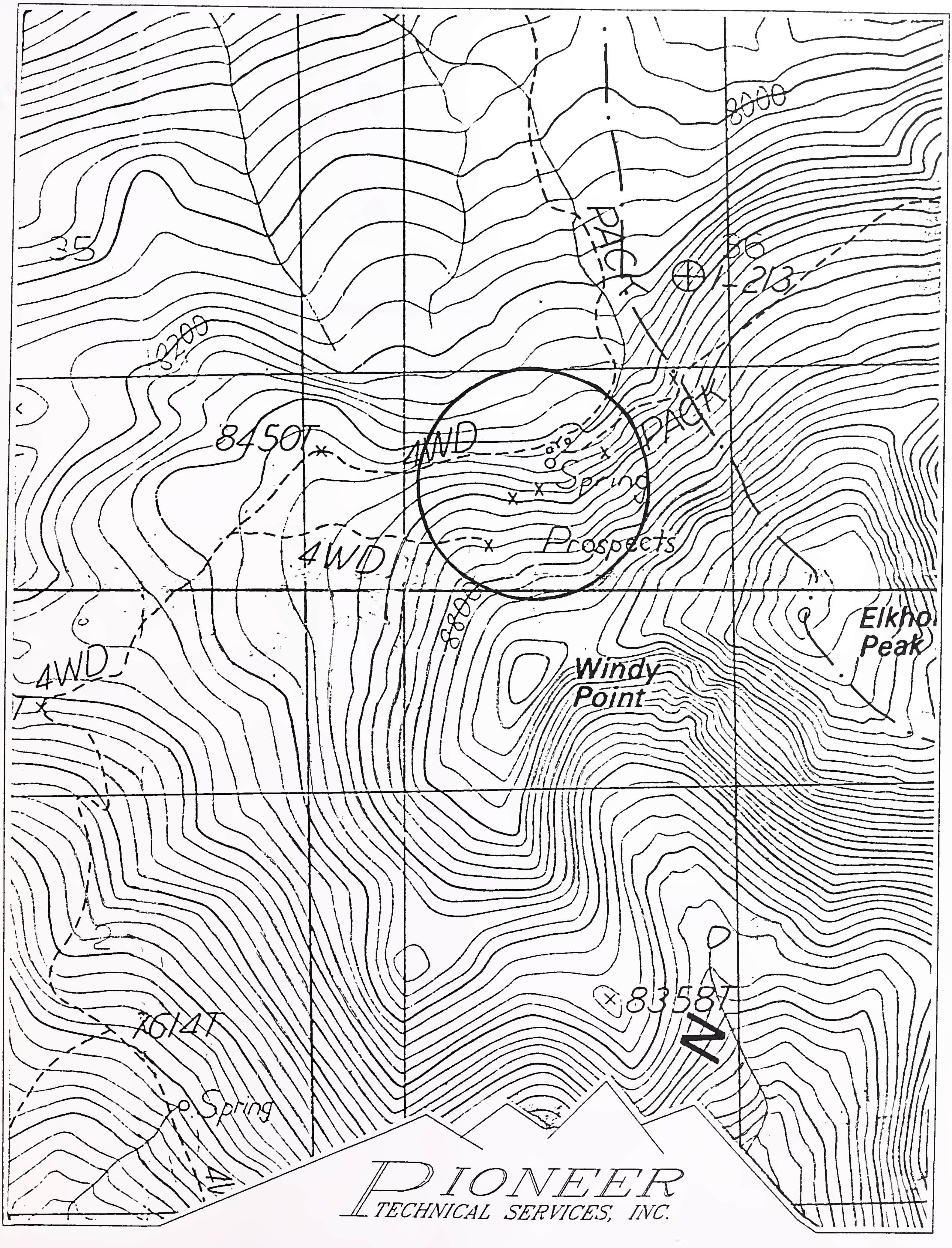
Origin of Ore Milled - Custom Mill___ **Dedicated Mill**___; **Number and names of mines that supplied mill feed:** N/A

Process? Hg-amalgam, CN⁻ leach (vat, heap), floatation, smelting?
N/A

Montana Bureau of Mines and Geology
Water Well Log Data

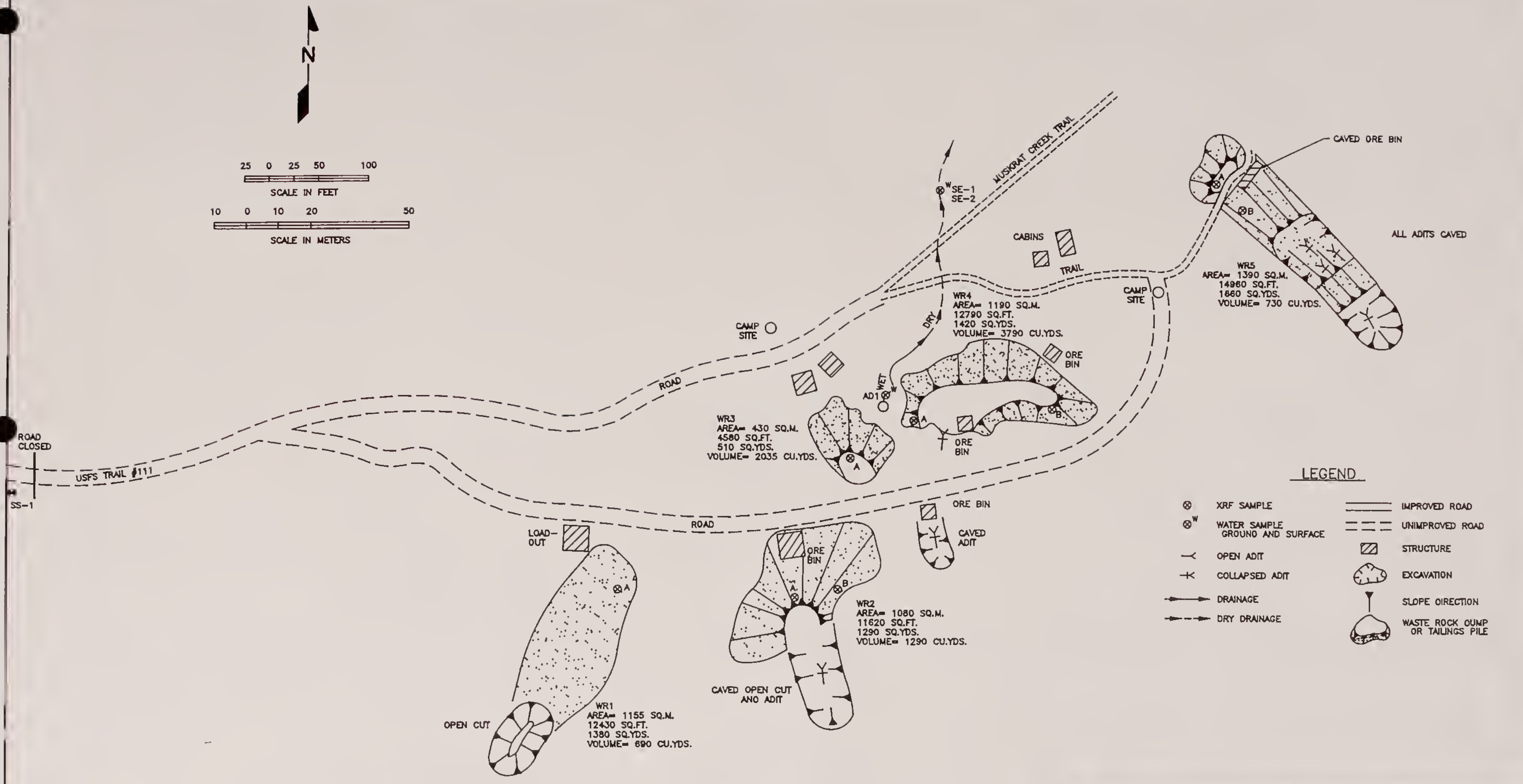
08/11/1994

Well No.	Location	Depth	Yield	Static Water Level
M:127080	07N 03W 25 ADD	120.0	51.0	42.00
M:55742	07N 02W 31	34.0	18.0	11.00



PIONEER
TECHNICAL SERVICES, INC.

IRON, P.A. NO. 22-359
T07N, R03W, SECTION 36
SCALE: 1" = 1000'



DRAWN FOR:

PIONEER
TECHNICAL SERVICES, INC.

TITLE:
IRON
PA# 22-359

DRAWING NO.: PT340239 REV: -
DATE: 11/19/94 PLOT SCALE: 1 = 30

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - *Use table on following page.*

Unique source identification: (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures/vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - *If tailings impoundments are also present, complete the following questions.*

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: Flammang, Belanger, West

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)[*]	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1A	WR	690	North face, mid-way down, 15' west of east side	None	7.13 (S)	0.03	22-359-WR-1	08/09/94 1900	T-Metals, ABA
WR-2A	WR	1,290	North face, lowest level of pile, near top	None	6.88 (S)	0.03			
WR-2B	WR		East side near top	None	5.49 (S)	0.03			
WR-3A	WR	2,035	North facing side, just off of top	None	< 3.5 (D)	0.04	22-359-WR-2	08/09/94 1915	T-Metals, ABA
WR-4A	WR	3,790	East end, north face	None	< 3.5 (D)	0.04			
WR-4B	WR		West end, south face	None	5.3 (D)	0.03			
WR-5A	WR	730	North face, east end, above trail	None	6.3 (D)	0.035			
WR-5B	WR		North face, east end, just below trail	None	6.7 (D)	0.04			
SS-1	SOIL	N/A	Background soil approx. 1/4 mile west of mine; 75' above road at road closure sign	N/A	N/A	N/A	22-359-SS-1	08/09/94 1600	T-Metals

[*] D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-359-WR-1 is composite of WR-1A, WR-2A and -2B, and WR-5A and -5B. 22-359-WR-2 is composite of WR-3A, and WR-4A and -4B.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes_X_, **No**___, **Number:**_1_ **Identification:**_Between bases of WR-3 and WR-4 (sampled as AD-1)_

Filled shafts: Yes___, **No**_X_, **Number:**____ **Identification:**____________

Seeps/Springs: Yes___, **No**_X_, **Number:**____ **Identification:**____________

Groundwater wells within 4 miles?: Yes_X_, **No**___;
Number of well logs:_16_

Distance to nearest well used for drinking:
___**<1,000 ft;**___**1,000 ft to 0.5 miles;**_X_**>0.5 miles.**

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, **Probable**____, **Possible**_X_, **Unlikely**____.
Uncontained waste rock containing elevated iron, copper, and zinc; groundwater may be in contact with metal bearing host rock i discharging adit.

Approximate Depth to Groundwater:_X_**<25 ft;**___ **25 - 100 ft;**___ **>100 ft.**

Other observations/notes: A piece of metal is lodged where adit discharges; water flows over metal and drops off edge where container could be placed. Mine is at head of USFS Iron Mine Trail No. 111, leading to Tizer Lakes (3 miles) and Muskrat Creek (1 mile). At least five small campsites with fire rings, fire wood, and cleared areas for tents present on site during this investigation. Adit discharge is the only water in the area and may be used for drinking by campers or hikers.

GROUNDWATER INVENTORY FORM

SAMPLERS: Belanger

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC $\mu S/cm$ @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
AD-1	AD	Sample taken where water flows off of metal sheet; associated with WR-4	10 gpm (E)	6.54	149	NM	2.7	62	N/A	22-359-AD-1	08/09/94 1300	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3

*FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): NM = Not Measured

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes____, No X, Name(s):

Dry streambeds: Yes X, No____, Name(s): Adit discharge flows approx. 100 feet and disappears into the ground. Below that, a dry streambed continues off the site.

Other surface water: Yes____, No X, Name(s)/Description:

Waste materials within any floodplain: Yes X, No____ **Source ID(s):** Adit discharge emerges between bases of WR-3 and WR-4.

Approximate Flood frequency? X 1 yr, ____10 yr, ____100 yr

Estimated seasonal flow of stream(s) (cfs/gpm)? 10 gpm
High Flow: 15 gpm, **Average Flow:** 10 gpm

Distance between waste source(s) and nearest surface water body (ft)? 0 feet between WR-3 and WR-4

Surface water draining onto or through waste sources: Yes X, No____, **Describe:** Discharge may be flowing through WR-3 and WR-4 before emerging at base.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?) Agriculture, irrigation; Boulder River has fishery, recreation, agriculture, and irrigation.

Observed erosional/sedimentation/stream turbidity problems? Yes X, No____. **Distance downstream (ft)?** 0-500____; 500-1,000 X; >1,000____. **Describe/explain** (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Iron-stained rocks and soils are present in dry drainage below the mine site; sediment sample collected contained elevated copper, zinc, and arsenic.

SURFACE WATER INVENTORY FORM

SAMPLERS: Belanger

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SE-1	SOIL	Soil sample approx. 200' below mine in dry drainage .	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis
SE-2	SOIL	Organic soil present above SE-1 in dry drainage 200' below mine	N/A	N/A	N/A	N/A	N/A	22-359-SE-2	08/09/94 1530	T-Metals

*FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ____________

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides? (SO_3)

Presence of evaporative salt deposits? (*ESD*)

Discolored or turbid seepage? (*SPG*)

Presence of long filamentous algae in drainages, mosses in moist areas?

Presence of ferric hydroxide precipitates? (*FEOX*)

Presence of burned or stressed vegetation? (*VEG*)

pH ≤ 5.0 (*pH*)

General Potential for AMD Mitigation:

Area available for treatment (acres)? Possibly 1/4 acre where cabins are

Wetlands present: Yes_X_, **No**_____, **Describe:** Very small streamside wetland where adit discharges

Carbonate rocks/soils: Yes_X_, **No**____, **Describe:** Literature indicates site is underlain by limestone.

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; **10-30**_X_; **30-100**___; **100-300**____; **300-1,000**____; **1,000-3,000**____; **3,000-10,000**____; **10,000 or greater**___; **Comments**________________

Nearest residence:___**<1,000 ft;**___**1,000 ft - 0.5 miles;**_X_**>0.5 miles.**

For each source (table next page):

Available fine materials? *Surface area?*

Uncovered and unvegetated? *Wet or dry?*

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Flammang, Belanger, West

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
WR-1	FEOX	Dry	12,430	11,810	Yes	Low
WR-2	FEOX	Dry	11,620	5,810	Yes	Low
WR-3	FEOX	Dry	4,580	4,580	Yes	Low
WR-4	FEOX	Dry	12,790	12,150	Yes	Low
WR-5	FEOX	Dry	14,960	13,460	Yes	Low
AD-1	None	N/A	N/A	N/A	N/A	N/A

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes_____, No_X_
Describe:____

Population within 1 mile: 1-10___; 10-30_X_; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments____

Evidence of recreational use on site: Yes_X_, No___, Describe:
Campsites; trailhead area, trail crosses lower part of WR-5.

Accessibility (check each that apply):_X_Easily accessible - no fences, gates, or warning signs;___Moderately Accessible - barbed wire fences, road gated, or signs posted;___Difficult Access - chain-link fence, road gated and locked, site guarded (does not include locked or manned access points located more than 0.5 miles from the actual site).

Sensitive environments on-site or adjacent to site:
State or National Parks - Yes___, No_X_, Comment__________
Wilderness Area - Yes___, No_X_, Comment__________
T&E Species Habitat - Yes___, No_X_, Comment__________
Bat Habitat - Yes___, No_X_, Comment__________

Primary Drainage_X_; Secondary Drainage___; No Information___:
Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium_X_, Low___
Fisheries Habitat and Species Classification - _4_
Sport Fishery Classification - _4_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes___, No_X_, Number____, types and locations:___
____

Hazardous structures: Yes_X_, No___, Number_8_, types and locations:
Loadout near base of WR-1, one above WR-3, and one at WR-4; 2 cabins collapsing below WR-3 and 3 collapsing cabins below WR-4.

Unstable highwalls, pits, trenches, slopes: Yes_X_, No___, Number_1_, types and locations: Collapsing adit associated with WR-2 appears to have unstable highwall (10 to 15 feet high).

Unstable waste piles, impoundments, undercut banks: Yes_X_, No____, Number_4_, types and locations: WR-1, WR-2, WR-3, and WR-5 are all very steep, unvegetated, and at angle of repose.

Fire and/or Explosion hazards: Yes___, No_X_, Explain:______________
____

Bibliography

MBMG, Mines and Mineral Deposits (Except Fuels), Jefferson County, Montana, Bulletin 16, Written by R.N. Roby, W.C. Ackerman, F.B. Fulkerson, and F.A. Crowley, June 1960.

MBMG, Well Log Database, July 14, 1994.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Iron, Prepared by Northern Engineering and Testing, Date Unknown.

USGS, Topographic Map, Elkhorn, Montana, 7 1/2 minute Quadrangle, 1985.

LABORATORY ANALYTICAL DATA

IRON
PA NO. 22-359

Iron PA# 22-359
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - FLAMMANG
INVESTIGATION DATE: 08/09/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-359-SE2	2.4	119	74.9	4.6	164	10.2	4130	115000	0.30	671	17.4	85.5	13.2 UJ	451	NR
22-359-WR1	0.6 U	47.6	34.8	4.0	27.1	2.8	487	64700	0.33	773	4.0	20.1	7.4 U	106	NR
22-359-WR2	2.5	64.0	80.0	3.5	21.1	6.0	410	75200	0.06	332	2.7	53.9	7.6 U	96.0	NR
BACKGROUND	2.0	95.9	105	3.2	5.0	10.5	60.0	13300	0.17	1020	6.8	90.7	12.0 U	110	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-359-WR1	0.04	1.25	8.81	7.56	0.04	<0.01	0.01	0.00	8.81
22-359-WR2	0.32	10.0	4.68	-5.3	0.24	0.03	0.05	0.94	3.75

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-359-AD1	0.12 UX	2.0	5.5 U	4.0 U	8.4 U	6.8 U	15.7	45.2	0.12	3.6	14.4 U	1.1 U	51.6 U	15.6 U	71.2

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-359-AD1	80	<5.0	10	0.09	NR

LEGEND

SE2 - Organic soil present above SE1 in dry drainage 200' below mine.
WR1 - Composite of subsamples WR1A, 2A, 2B, 5A, and 5B.
WR2 - Composite of subsamples WR3A, 4A, and 4B.
BACKGROUND - From the Iron Mine (22-359-SS1).
AD1 - Sample where water flows off metal sheet; associated with WR4.

XRF ANALYSIS RESULTS

IRON
PA NO. 22-359

Mine Name: Iron PA# 22-359
XRF Field Analyses
Results In PPM

XRF SAMPLE I.D.	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Ni	Cu	Zn	As	Sr
22-359-SE1		17361.5	19984.6	3264.58		1543.32 *	48669.2			497.251	307.443		354.537
22-359-SE2		7760.8	18003.5	1066.34		2089.96 *	145451	997.083 *		5076.97	726.011	124.588 *	161.155
22-359-WR1A		12054.3	20493	1923.92		5473.68	132977			1927.31	558.277	213.435 *	296.105
22-359-WR1-COMP		14221.7	17573.2	1876		2881.13 *	181827			531.808 *	325.366 *	142.073 *	398.767
22-359-WR2A		8108.22	14783.3	1758.28		4546.6	314828	1545.66 *	467.212 *	677.54 *	266.496 *		294.755
22-359-WR2B		6416.38	27169.7	1141.69		4592.1	340057			1117.91	387.827 *	323.177 *	131.945
22-359-WR2-COMP		15542.3	18181.8	2350.81		1501.54 *	115406	1063.58 *		357.719 *	225.483 *	131.67 *	365.829
22-359-WR3		12681.8	18745.6	2433.33		820.913 *	142246			622.092	156.658 *	77.1389 *	270.264
22-359-WR4A		14298.4	16109.7	2109.66		1243.24 *	110704		198.978 *	178.463 *	223.002 *		255.522
22-359-WR4B		14403.3	16757.7	2142.83		1156.28 *	46915.2				100.376 *	238.027	402.387
22-359-WR4B-DUP		14123.3	16894.2	2536.68	334.304 *	1329.07 *	47046.1				120.078 *	248.983	427.181
22-359-WR5A		15816.9	8705.99	1613.51		1410.38 *	84238				144.054 *	171.532 *	393.129
22-359-WR5B		15839.6	11884.5	1830.34		1873.69 *	99075	1270.97 *			132.593 *		438.707

XRF SAMPLE I.D.	Zr	Hg	Mo	Pb	Rb	Cd	Sn	Sb	Ba	Ag	U	Th
22-359-SE1	222.495				100.366				354.732			
22-359-SE2	86.1917			89.6433 *					158.549			
22-359-WR1A	178.913				43.8716 *				306.191	113.094 *		
22-359-WR1-COMP	172.203				60.297 *				504.565			10.0662 *
22-359-WR2A	147.817								294.195			
22-359-WR2B	91.4702								126.077 *			
22-359-WR2-COMP	189.674				53.805 *				490.929			
22-359-WR3	187.754				45.9243 *	183.844 *			385.866			
22-359-WR4A	164.691			181.465 *	56.3076 *				303.595			
22-359-WR4B	213.06				57.4302 *				553.637			19.1044 *
22-359-WR4B-DUP	211.495				71.9165 *				604.184			11.2234 *
22-359-WR5A	183.581				51.8773 *				616.67			12.3172 *
22-359-WR5B	198.478				63.8617 *				596.821			

* = Estimated Quantity

$ = Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

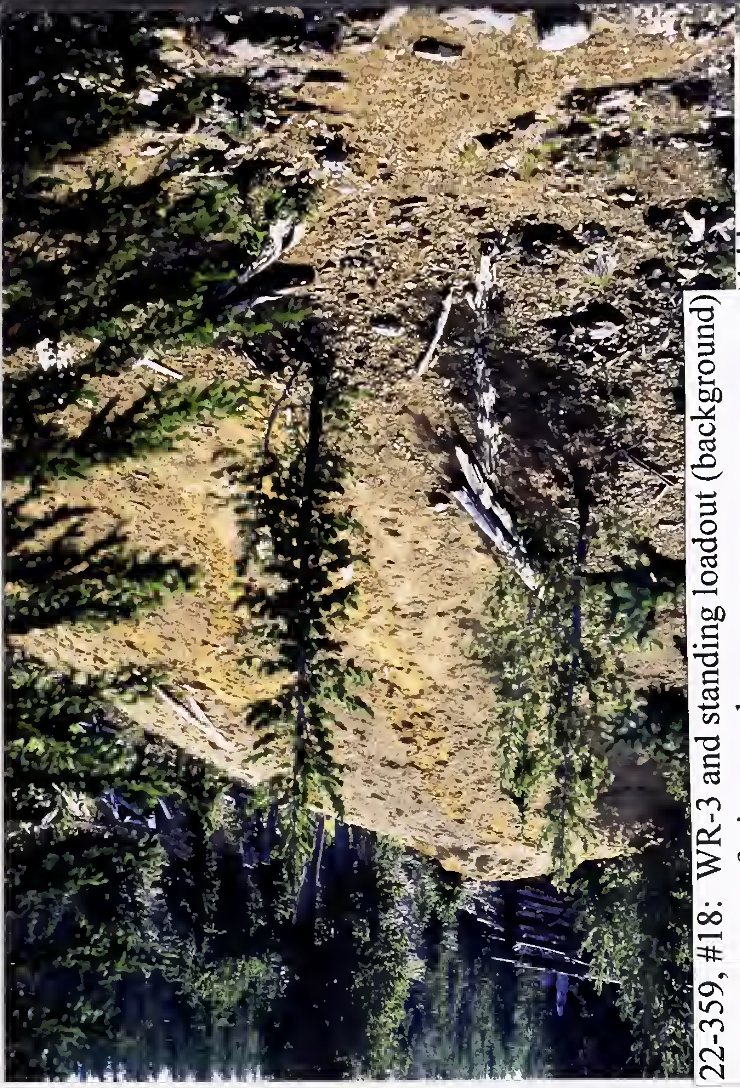
IRON
PA NO. 22-359

AIMSS SCORESHEET

SITE NAME: Iron
PA NUMBER: 22-359

LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.715
6	GW - TARGETS	WELLS - 1 MI. x 2.5		5.0
7		WELLS - 1 TO 4 MI		14
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	19.0
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	5434
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
12		EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	400
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.046
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		1
18		WETLANDS		10
19		FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	19
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	7950
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		5
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	25
27		LIKELIHOOD SCORE	LINES 25 + 26C	25
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.012
29	AIR - TARGETS	POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	20
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	6
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		50
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	150
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.000
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		10
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		5
43		TARGETS SCORE	SUM LINES 40 THRU 42	15
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	0
45	**TOTAL SITE HUMAN &**	**ENVIRONMENTAL HAZARD SCORE** (LINES 10 + 24 + 35 + 44) / 100,000		0.13

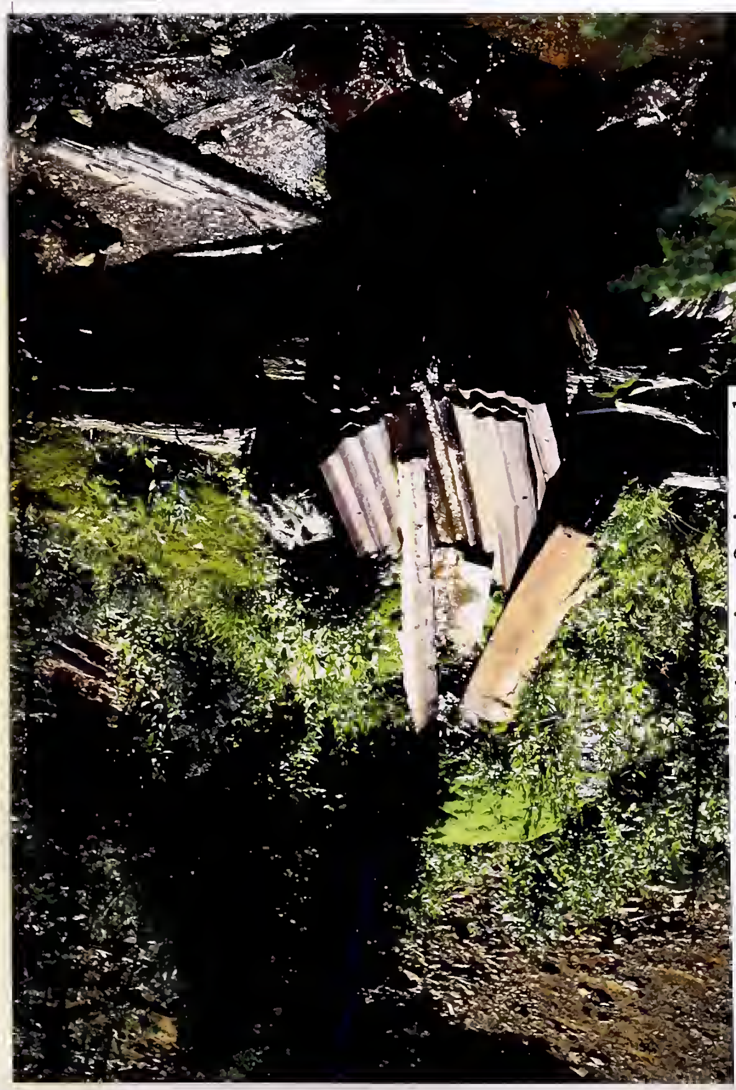
				SITE NAME:	Iron
LINE NO.		SITE SAFETY		PA NUMBER:	22-359
1	THREAT	ACCESSIBILITY			20
2		OPEN SHAFTS	100 EA.		0
3		OPEN ADITS	50 EA.		0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.		75
5		HAZ. STRUCTURES	40 EA.		320
6		EXPLOSIVES			0
7		HAZ. MATERIALS			0
8		HAZARDS SCORE	SUM LINES 2 THRU 7		395
9		POPULATION - 1 MILE			10
10	TARGETS	NEAREST RESIDENCE			0
11		RECREATIONAL USE			5
12		TARGETS SCORE	SUM LINES 9 THRU 11		15
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000		118.50



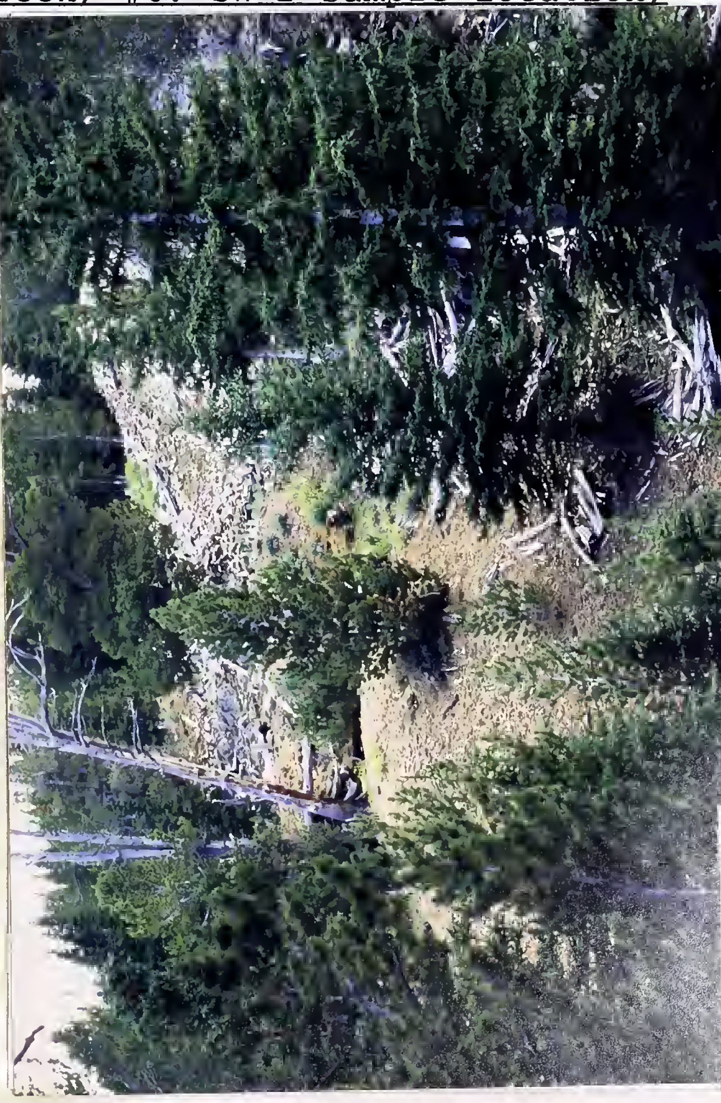
22-359, #18: WR-3 and standing loadout (background) facing south

22-359, #20: WR-1, -2, -3, and -4 from WR-5 facing west

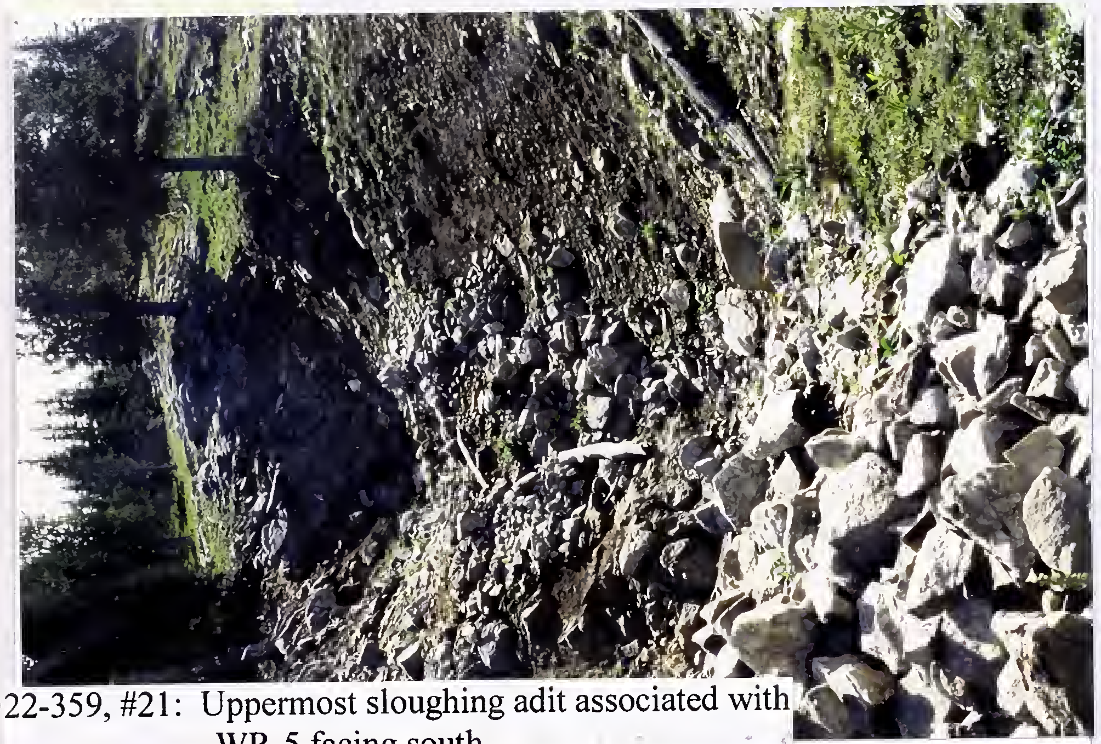
Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #5: SW-1 sample location, downstream in Turnley Creek; #6: SW-2 sample location,



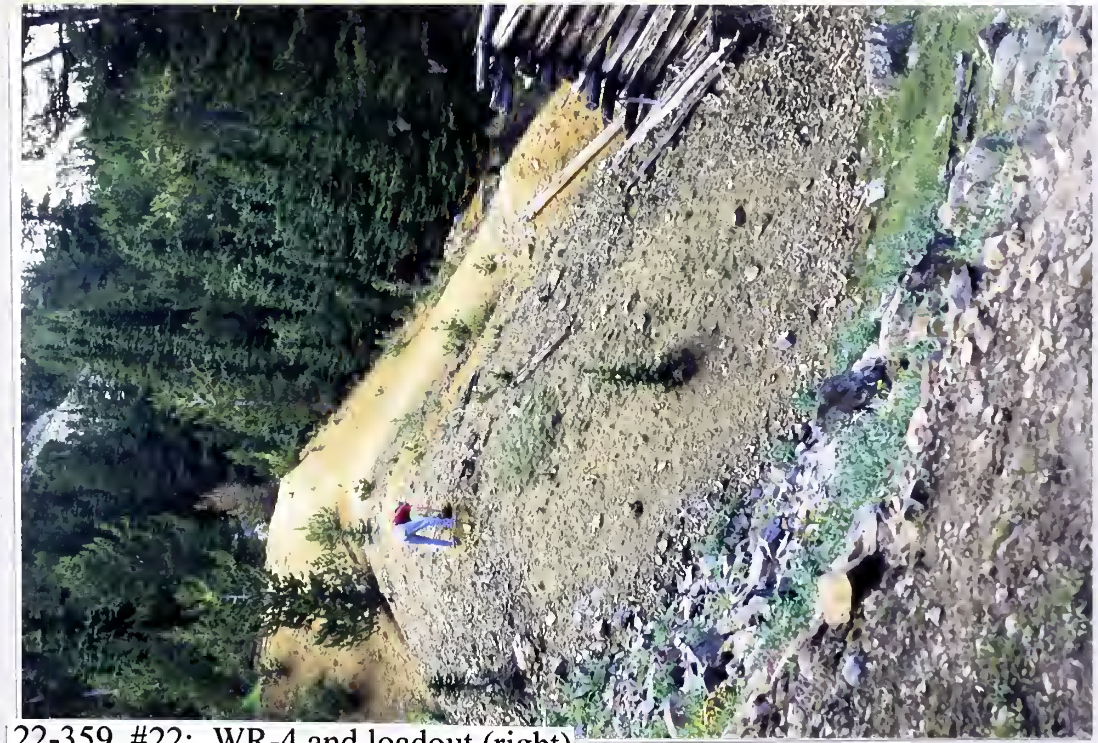
22-359, #17: AD-1 sample location facing south



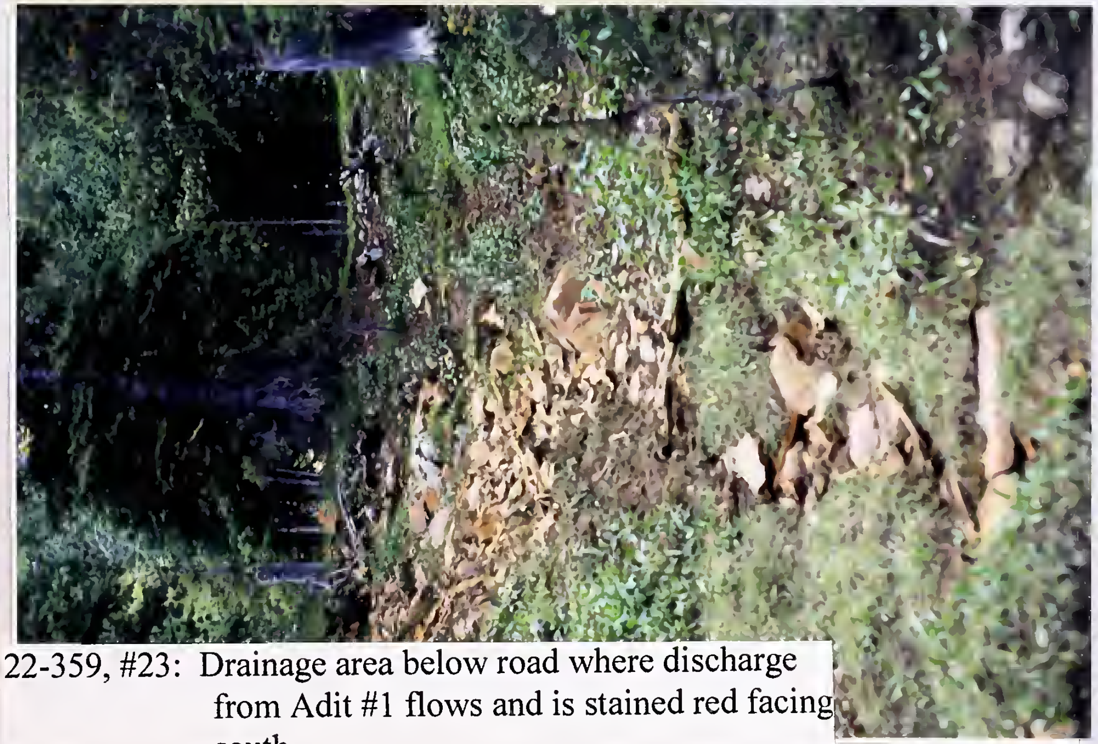
22-359, #19: WR-5



22-359, #21: Uppermost sloughing adit associated with WR-5 facing south



22-359, #22: WR-4 and loadout (right)



22-359, #23: Drainage area below road where discharge from Adit #1 flows and is stained red facing south

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: TRUMLEY HEAP LEACH **PA#:** 22-501

Date: July 1, 1994 **Time:** 0930-1430

Field Team Leader: Bisch, Pioneer

Sampling Personnel: Flammang, West; Pioneer

Visitors: None

Weather/Seasonality Observations: Sunny; slight breeze; hot (80°F).

Photographic Log (Film Roll and Photo No.'s/Video Tape Number)**:** #5: SW-1 sample location, downstream in Turnley Creek; #6: SW-2 sample location, upstream in Turnley Creek; #7: Reclaimed area facing south (west monitoring well in foreground); #8: Evidence of liner at site; #9: Run-on diversion ditch along east side of site; #10: Reclaimed area facing north (Turnley Creek in background); #11: Run-on diversion ditch facing northeast. Video Tape No. 2

General Comments/Observations (not covered specifically in attached Inventory Forms)**:** Site has been reclaimed; heap leach area is apparently lined, has been leveled, and topsoiled. The entire site has a three-strand barbed wire fence around it, though the road runs through the lower (north) part of the site with no gates or obstructions. A ditch has been constructed on the east side of the site to route any precipitation from a dry drainage at the south end of the site away from it.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Site has been coversoiled and revegetated with only some minor surficial tailings exposed in the area.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): TRUMLEY HEAP LEACH **PA#:** 22-501

Legal Description: **T** 6N **;R** 3W **;Sec.** 15 , NW **1/4** SW **1/4** ____ **1/4**

County: JEFFERSON **Mining District:** ELKHORN

Latitude: N 46° 16' 13" **Longitude:** W 111° 58' 15"

Primary Drainage Basin and Code: Elkhorn Creek/10020006
Secondary Drainage Basin: Turnley Meadows Creek

USGS Quadrangle map name(s): Elkhorn

Mine Type/Commodities: Millsite/Gold

Activity Status: **Active**___, **Inactive/Exploration**___, **Abandoned** X .

Ownership: Known Y X **N**___; **private/public?** Private
Owner, Agent, or Contact (Include address and phone when available)**:** Mary Lewis, 74394 Wortman Road, Rainier, OR 97048.

Relationship to other mines/sites in the area/district: Unknown

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? The entire site has been reclaimed.

General site features: Elevation 5940' , **Slope** 5° ,
Aspect East

Land use: Mining___, **Recreational** X , **Residential**___, **Urban**___,
Agricultural X , **Other(Specify)**

Area of disturbed/unvegetated lands? Approx. 3.5 **acre(s).**
Site Dimensions: 450 feet x 340 feet

Predominant vegetation types: Lodgepole pine, willows, grasses

Access: roads - good (paved)___, **poor (maintained dirt road)** X ,
4wd___, **trail**___.
Other logistical considerations (proximity to other sites).
Approximately 1/2 mile north of the Queen (Tourmaline Queen) Mine.

Well logs within 1 mile radius; (Attach MBMG Well Log Printout(s): There are 9 wells reported within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Perennial Turnley Meadow Creek flows from northwest to southeast past the northeast end of the site. Turnley Meadow Creek flows into Elkhorn Creek 1 1/4 miles south of the site. Elkhorn Creek then flows southwest to the Boulder River 8 1/2 miles away. The site is underlain by alluvium, Precambrian sediments or andesite.

Mining/milling history, ore type/tenor, host rock, gangue: No information available.

Mine Operation?
Shafts - Yes___, No_X_, # ____, Comment
Adits - Yes___, No_X_, # ____, Comment
Pits - Yes___, No_X_, # ____, Comment
Placers - Yes___, No_X_, # ____, Comment
Other - Yes___, No_X_, # ____, Comment

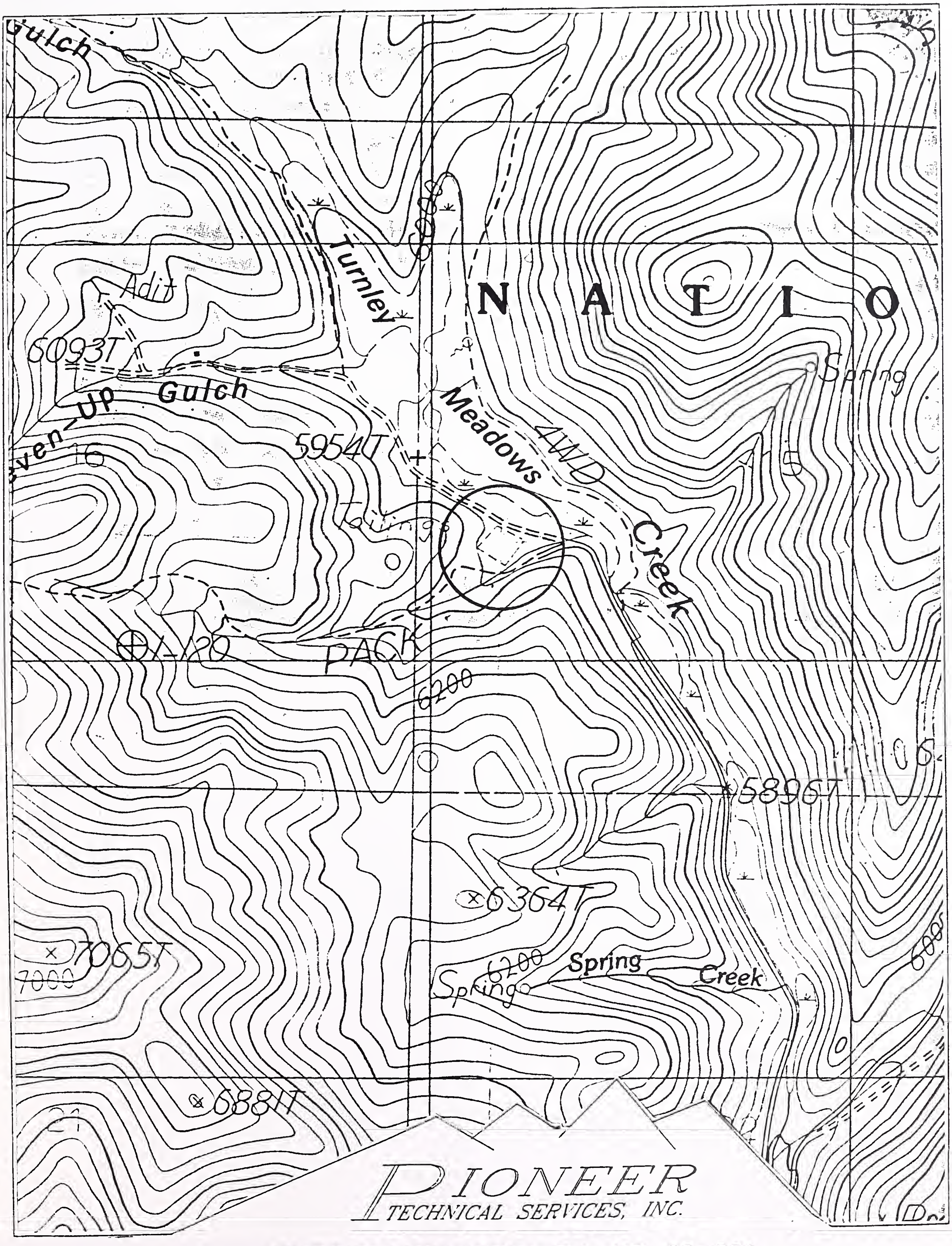
Mill Operation? Yes_X_, No____. If yes answer the next three questions:

Period(s) of Operation: Unknown

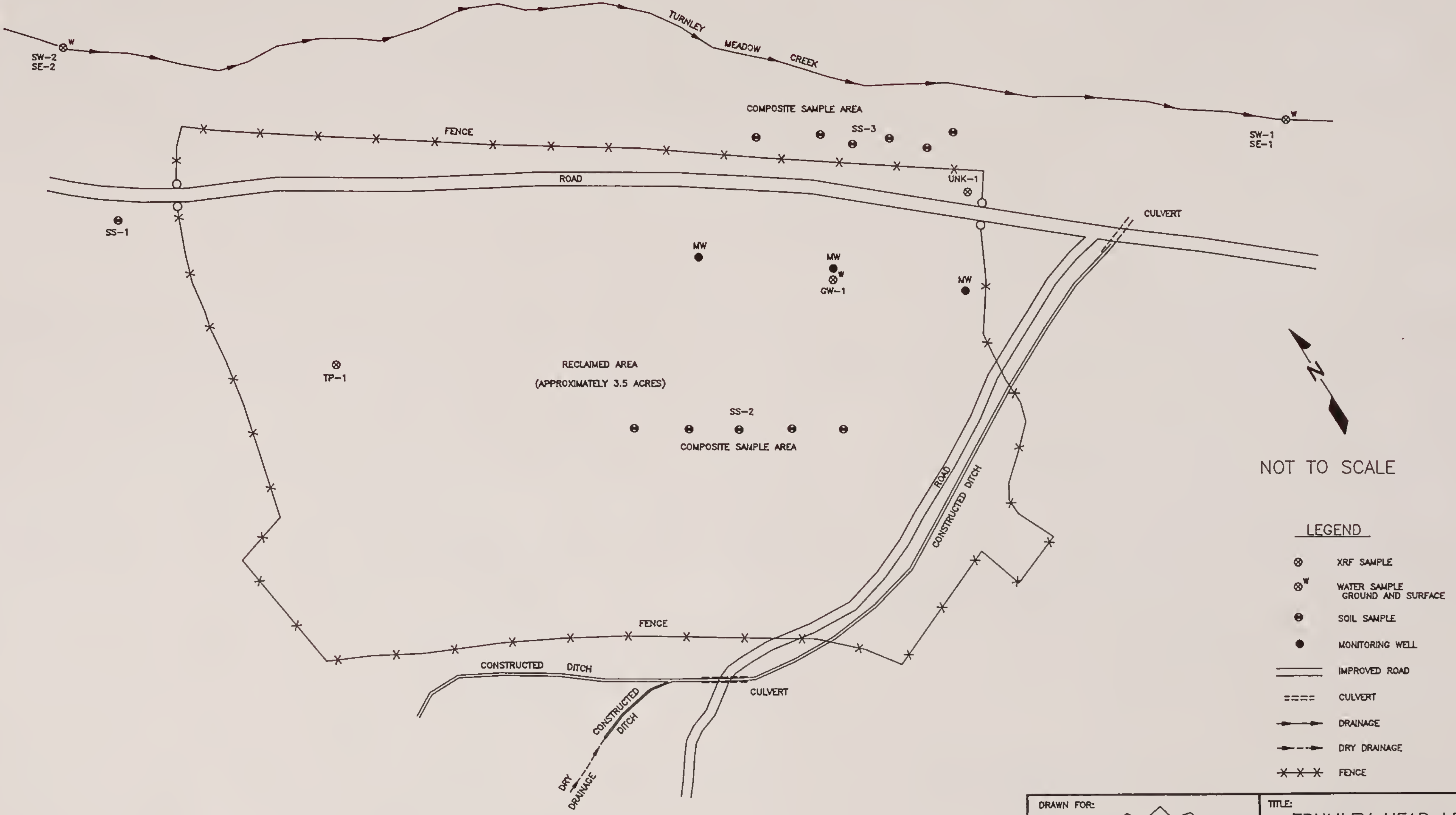
Origin of Ore Milled - Custom Mill___ Dedicated Mill___; Number and names of mines that supplied mill feed: Unknown

Process? Hg-amalgam, CN⁻ leach (vat, heap), floatation, smelting?
Cyanide leach

Well No.	Location	Depth	Yield	Static Water Level
[illegible]:53338	06N 03W 14 BA	185.0	99.0	170.00
M:53341	06N 03W 15	84.0	4.0	15.00
M:53339	06N 03W 15	125.0	20.0	5.00
M:53340	06N 03W 15	64.0	30.0	10.00
M:53342	06N 03W 15 DAC	27.0	1000.0	15.00
M:5401	06N 03W 22 ABB	18.0	0.0	6.47
M:5399	06N 03W 22 ABB	78.0	0.0	8.49
M:5400	06N 03W 22 ABB	18.0	0.0	6.97
M:5402	06N 03W 22 ABB	65.0	0.0	6.37



TRUMLEY HEAP LEACH, P.A. NO. 22-501
T06N, R03W, SECTION 15
SCALE: 1" = 1000'



DRAWN FOR:
PIONEER
TECHNICAL SERVICES, INC.

TITLE:
TRUMLEY HEAP LEACH
PA# 22-501

DRAWING NO.: PT340201 REV: -
DATE: 11/19/94 PLOT SCALE: 1 = 1

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. **Waste Characteristics** - *Use table on following page.*

Unique source identification: (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures/vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. **TAILINGS IMPOUNDMENTS** - *If tailings impoundments are also present, complete the following questions.*

Describe the tailings grain size distribution (approximate % sand, silt, & clay): Possible tailings ranged from silt to sand.

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): Small, shallow piles of possible tailings are scattered around the site; appear to have been moved around during reclamation.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Unknown; small piles of possible tailings were dry.

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): No signs of former impoundment; site has been leveled.

Comments on potential for mitigation: The site appears to have been sufficiently remediated.

SOURCE INVENTORY FORM

SAMPLERS: Flammang, West

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
TP-1	TAIL	60*	Possible tailings on west side of reclaimed area, poorly vegetated; light tan silt	Possible liner	5.8 (D)	0.03	22-501-TP-1	07/01/94 1800	T-Metals, ABA, Cyanide
UNK-1	TAIL	ND	Possible tailings in the northeast corner by the fence and by eastern-most monitoring well; tan sand and light tan sand	None	7.0 (D)	0.02			
SS-1	SOIL	N/A	Background soil on west side of reclaimed area, above fence in trees	N/A	N/A	N/A	22-501-SS-1	7/01/94 1330	T-Metals, ABA
SS-2	SOIL	5,600*	5 point composite on line 50' apart across sparsely vegetated reclaimed area; light tan silt	Possible liner	6.0 (D)	0.045	22-501-SS-2	07/01/94 1330	T-Metals
SS-3	SOIL	N/A	5 point composite on line 50' apart below fenceline, downgradient of old heap leach; dark brown loam	None	7.0 (D)	0.03	22-501-SS-3	07/01/94 1230	T-Metals

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-501-TP-1 is composite of TP-1 and UNK-1. ND = Not Determined. *Because tailings were reclaimed and there was a possibility of a liner, no depths were determined; one foot depth was used (very conservative estimate).

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map

Flowing adits: Yes___, No_X_, Number:____ Identification:______________

Filled shafts: Yes___, No_X_, Number:____ Identification:______________

Seeps/Springs: Yes___, No_X_, Number:____ Identification:______________

Groundwater wells within 4 miles?: Yes_X_, No___;
Number of well logs: 15

Distance to nearest well used for drinking:
___<1,000 ft;___1,000 ft to 0.5 miles;_X_>0.5 miles.

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable____, Possible_X__, Unlikely____.
Liner appears to be in poor shape, based on the number of pieces of liner scattered on the ground. Tailings present appear to contai elevated metal values.

Approximate Depth to Groundwater:_X_<25 ft;___ 25 - 100 ft;___ >100 ft.

Other observations/notes: There are three monitoring wells present immediately downgradient of the reclaimed area. The monitoring well furthest west (#1) has depth to water at 9.65 feet with a total depth of over 104 feet. The monitoring well in the middle (#2) was sampled and has a depth to water of 8.15' with a total depth of 12.4'. The furthest east monitoring well has a depth to water of 10.75' with a total depth of 81.5'. There is another monitoring well located downgradient and across Turnley Meadows Creek; this well was not investigated. No upgradient well could be found; wells installed by Lindsay Well Drilling from Clancy, MT.

GROUNDWATER INVENTORY FORM

SAMPLERS: Bisch, West

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
GW-1	MW	Center monitoring well, uppermost aquifer	N/A	6.86	1275	338.1	11.6	N/A	8.15'	22-501-GW-1	07/01/94 1300	D-Metals, TDS, Hardness, Cl, SO4, NO2/NO3, Cyanide
GW-2	MW	Duplicate of GW-1	N/A	6.86	1275	338.1	11.6	N/A	8.15'	22-501-GW-2	07/01/94 1310	D-Metals, TDS, Hardness, Cl, SO4, NO2/NO3, Cyanide
GW-3	GW	Blank	N/A	N/A	N/A	N/A	N/A	N/A	N/A	22-501-GW-3	07/01/94 1730	D-Metals, Cyanide

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ______

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: **Yes** X , **No** ___, **Name(s):** Turnley Meadows Creek

Dry streambeds: **Yes** X , **No** ___, **Name(s):** Unnamed dry tributary to Turnley Meadows Creek; a ditch has been constructed to route any flow around and to the east side of the reclaimed area.

Other surface water: **Yes** ___, **No** X , **Name(s)/Description:** ___

Waste materials within any floodplain: **Yes** ___, **No** X **Source ID(s):** ___

Approximate Flood frequency? ___ **1 yr,** ___ **10 yr,** ___ **100 yr**

Estimated seasonal flow of stream(s) (cfs/gpm)? N/A
High Flow: ___, **Average Flow:** ___

Distance between waste source(s) and nearest surface water body (ft)? 200 feet between base of reclaimed area and stream

Surface water draining onto or through waste sources: **Yes** ___, **No** X ,
Describe: Precipitation only

Surface water use within 15 miles downstream? **(Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)**
Agriculture, irrigation, fishery, wetlands

Observed erosional/sedimentation/stream turbidity problems? Yes ___, **No** X . **Distance downstream (ft)? 0-500** ___; **500-1,000** ___; **>1,000** ___.
Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): ___

SURFACE WATER INVENTORY FORM

SAMPLERS: Bisch

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	Downstream in Turnley Creek	7.85	120	19.2	41	3.72 cfs (M)	22-501-SW-1	07/01/94 1105	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-1	SE	Downstream in Turnley Creek	N/A	N/A	N/A	N/A	N/A	22-501-SE-1	07/01/94 1105	T-Metals
SW-2	SW	Upstream in Turnley Creek	7.83	117	17.0	56	3.72 cfs (M)	22-501-SW-2	07/01/94 1200	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-2	SE	Upstream in Turnley Creek	N/A	N/A	N/A	N/A	N/A	22-501-SE-2	07/01/94 1200	T-Metals
SE-500	SE	500 feet downstream from SE-1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis
SE-1000	SE	1,000 feet downstream from SE-1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis

*FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ______

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides? (SO_3)

Presence of evaporative salt deposits? (ESD)

Discolored or turbid seepage? (SPG)

Presence of long filamentous algae in drainages, mosses in moist areas?

Presence of ferric hydroxide precipitates? (FEOX)

Presence of burned or stressed vegetation? (VEG)

pH ≤ 5.0 (pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 3.5 acres of reclaimed area

Wetlands present: Yes_X_, **No**___, **Describe:** Streamside

Carbonate rocks/soils: Yes_X_, **No**_____, **Describe:** Soils slightly carbonaceous; reclaimed area appears to have been limed.

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; **10-30**___; **30-100**_X_; **100-300**____; **300-1,000**____; **1,000-3,000**____; **3,000-10,000**____; **10,000 or greater**___; **Comments**

Nearest residence:___**<1,000 ft;**___**1,000 ft - 0.5 miles;**_X_**>0.5 miles.**

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Flammang

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
TP-1	None	Dry	1,625	1,220	Yes	Low
SS-2	None	Dry	150,835	75,420	Yes	None

Notes and Clarifications: TP-1 is possible tailings moved during reclamation. SS-2 is reclaimed area.

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes_____, No_X_
Describe:____

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments_None_______________________________________

Evidence of recreational use on site: Yes_X_, No___, Describe:_Bullet holes in well casing; tourists from town of Elkhorn located 1 mile northeast._

Accessibility (check each that apply):_X_Easily accessible - no fences, gates, or warning signs;___Moderately Accessible - barbed wire fences, road gated, or signs posted;___Difficult Access - chain-link fence, road gated and locked, site guarded (does not include locked or manned access points located more than 0.5 miles from the actual site).

Sensitive environments on-site or adjacent to site:
State or National Parks - Yes___, No_X_, Comment______________
Wilderness Area - Yes___, No_X_, Comment______________
T&E Species Habitat - Yes___, No_X_, Comment______________
Bat Habitat - Yes___, No_X_, Comment______________

Primary Drainage___; Secondary Drainage_X_; No Information___:
Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium_X_, Low___
Fisheries Habitat and Species Classification - _4_
Sport Fishery Classification - _4_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes___, No_X_, Number____, types and locations:___
____

Hazardous structures: Yes___, No_X_, Number____, types and locations:_
____

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____, types and locations:___________________________________
____

Unstable waste piles, impoundments, undercut banks: Yes____, No_X_, Number____, types and locations:___________________________
____

Fire and/or Explosion hazards: Yes___, No_X_, Explain:______________
____

Bibliography

MBMG, Well Log Database, July 14, 1994.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Queen/Tourmaline Queen, Prepared by Pioneer Technical Services, August 16, 1993.

USGS, Topographic Map, Elkhorn, Montana, 7 1/2 minute Quadrangle, 1985.

LABORATORY ANALYTICAL DATA

TRUMLEY HEAP LEACH
PA NO. 22-501

MDSL AMRB/PIONEER 5/16/94

Trumley Heap Leach PA# 22-501
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER -
INVESTIGATION DATE: 07/05/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-501-SE1	0.6 U	8.3	28.0	0.6 U	5.7	12.8	13.6	8610	0.03 U	180	6.4	8.1 U	6.5 UJ	37.7 J	NR
22-501-SE2	0.7 U	8.1	19.2	0.7 U	2.5	5.8	7.2	8780	0.03 U	137	3.5	9.2 U	7.4 UJ	13.7 J	NR
22-501-SS2	10.7	459	83.3	31.6	12.3	12.5	94.6	24500	0.59	866	10.7	863	47.6 J	2860 J	NR
22-501-SS3	4.1	29.9	181	10.0	8.9	25.8	51.7	18800	0.25	961	13.9	239	16.3 J	902 J	NR
22-501-TP1	55.2	229	17.5	130	3.4	2.4	367	9570	2.83	1920	3.2	3710	309 J	12100 J	NR
BACKGROUND	0.5 U	21.3	267	0.5 U	9.3	15.0	13.9	17400	0.05	1410	11.1	17.7	5.8 UJ	85.8 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-501-TP1	0.05	1.56	146	145	<0.01	0.03	0.09	0.94	145

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-501-GW1	0.12 U	1.1 U	50.9	2.6 U	11.1 JX	4.7 U	4.6 U	15.0	0.11 U	4.4 U	8.0 U	2.3	29.4 U	13.9	503
22-501-GW2	0.12 U	1.1 U	50.5	2.6 U	10.7 JX	4.7 U	4.6 U	9.4 U	0.11 U	4.4 U	8.0 U	1.8	29.4 U	17.2	510
22-501-GW3	0.12 U	1.1 U	2.1 U	2.6 U	8.7 UX	4.7 U	4.6 U	9.4 U	0.11 U	4.4 U	8.0 U	0.4 U	29.4 U	4.5 U	<0.1
22-501-SW1	0.12 U	1.4	11.9	2.6 U	8.7 UX	4.7 U	4.6 U	410 J	0.11 U	29.1	8.0 U	1.0	29.4 U	5.1	57.1
22-501-SW2	0.12 U	1.5	8.7	2.6 U	8.7 UX	4.7 U	4.6 U	240 J	0.11 U	19.2	8.0 U	0.7	29.4 U	4.5 U	52.2

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-501-GW1	911	<5.0	532	1.72	0.01
22-501-GW2	997	<5.0	507	1.66	<0.005
22-501-GW3	NR	NR	NR	NR	<0.005
22-501-SW1	57	<5.0	10	0.07	0.01
22-501-SW2	80	<5.0	9.0	0.07	<0.005

LEGEND

SE1 - Downstream in Tumley Creek.
SE2 - Upstream in Tumley Creek.
SS2 - 5 point composite on line 50' apart across sparsley vegetated reclaimed area.
SS3 - 5 point composite on line 50' apart below fenceline, downgradient of reclaimed area.
TP1 - Composite of subsamples TP1 and UNK-1.
BACKGROUND - From the Trumley Heap Leach (22-501-SS1).

GW1 - Center monitoring well, uppermost aquifer.
GW2 - Duplicate of GW1.
GW3 - Blank sample.
SW1 - Same as sample 22-501-SE1.
SW2 - Same as sample 22-501-SE2.

XRF ANALYSIS RESULTS

TRUMLEY HEAP LEACH
PA NO. 22-501

MDSL AMRB/PIONEER 5/16/94

Mine Name: Trumley Heap Leach PA# 22-501
XRF Field Analyses
Results in PPM

XRF SAMPLE I.D.	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Ni	Cu	Zn	As	Sr
22-501-SE1000		8141.85	9036.98	818.902		553.804 *	13335.2				135.047 *	81.7073 *	254.145
22-501-SE500		4523.59	5872.34	480.689 *	220.814 *	1106.6 *	14658.2				178.856 *	104.852 *	158.432
22-501-SS2		19507.1	46509.1	2839.34		1555.71 *	35149.4			108.598 *	2935.78	563.597	286.873
22-501-SS3		15929.8	22671.2	2495.02		1966.38 *	28078.9				1117.25	125.863 *	269.362
22-501-TP1		11239.3	139789	598.568 *		3089.29	13950.9			582.146	14678.7		92.8879
22-501-TP1-COMP		10365.8	139461	658.774 *		2994.54	11813			410.402 *	11136.1		63.8619
22-501-UNK1		6475.27	129888	367.879 *		2043.08 *	8156.65			146.724 *	8898.1		70.5995

XRF SAMPLE I.D.	Zr	Hg	Mo	Pb	Rb	Cd	Sn	Sb	Ba	Ag	U	Th
22-501-SE1000	195.037		8.63013 *		71.7709				364.725			15.1505 *
22-501-SE500	184.341		6.26967 *		43.482 *			39.0924 *	161.547			13.1115 *
22-501-SS2	231.677			773.284	111.685			161.918 *	567.809			12.7273 *
22-501-SS3	262.377			216.802	135.919			81.6733 *	357.319			16.0519 *
22-501-TP1	70.2436			4941.92	49.9115 *	251.453 *		1425.39	72.5239 *	137.04 *		35.8045 *
22-501-TP1-COMP	70.1069		8.24746 *	3452.59	40.442 *	211.341 *		1018.73	49.5639 *			
22-501-UNK1	48.4958			1771.31	23.6671 *			541.388				

* = Estimated Quantity

$ = Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

TRUMLEY HEAP LEACH
PA NO. 22-501

AIMSS SCORESHEET

SITE NAME: Trumley Heap Leach
PA NUMBER: 22-501

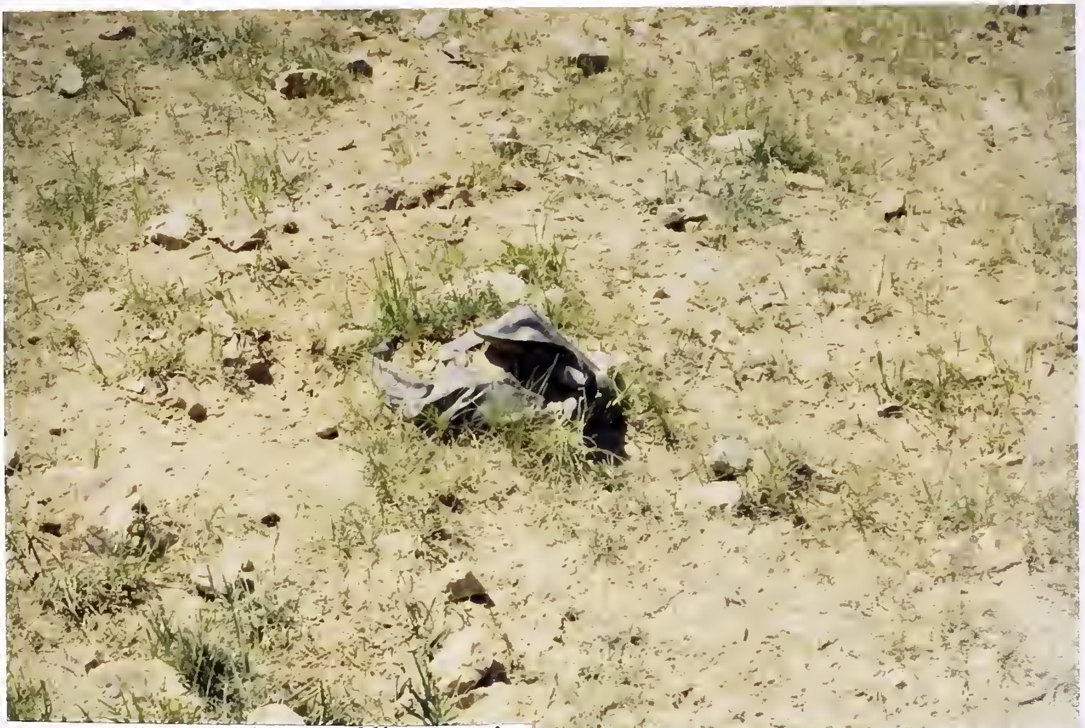
LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	4.209
6	GW - TARGETS	WELLS - 1 MI. x 2.5		22.5
7		WELLS - 1 TO 4 MI		6
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	28.5
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	47983
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
12		EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		2
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	40
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	40
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	4.551
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19		FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	18
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	3277
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		5
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	25
27		LIKELIHOOD SCORE	LINES 25 + 26C	25
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.195
29	AIR - TARGETS	POPULATION - 4 MILES		30
30		NEAREST RESIDENCE		0
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	40
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	195
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		50
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	150
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.179
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		0
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		5
43		TARGETS SCORE	SUM LINES 40 THRU 42	5
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	134
45	TOTAL SITE HUMAN &	ENVIRONMENTAL HAZARD SCORE (LINES 10 + 24 + 35 + 44) / 100,000		0.52

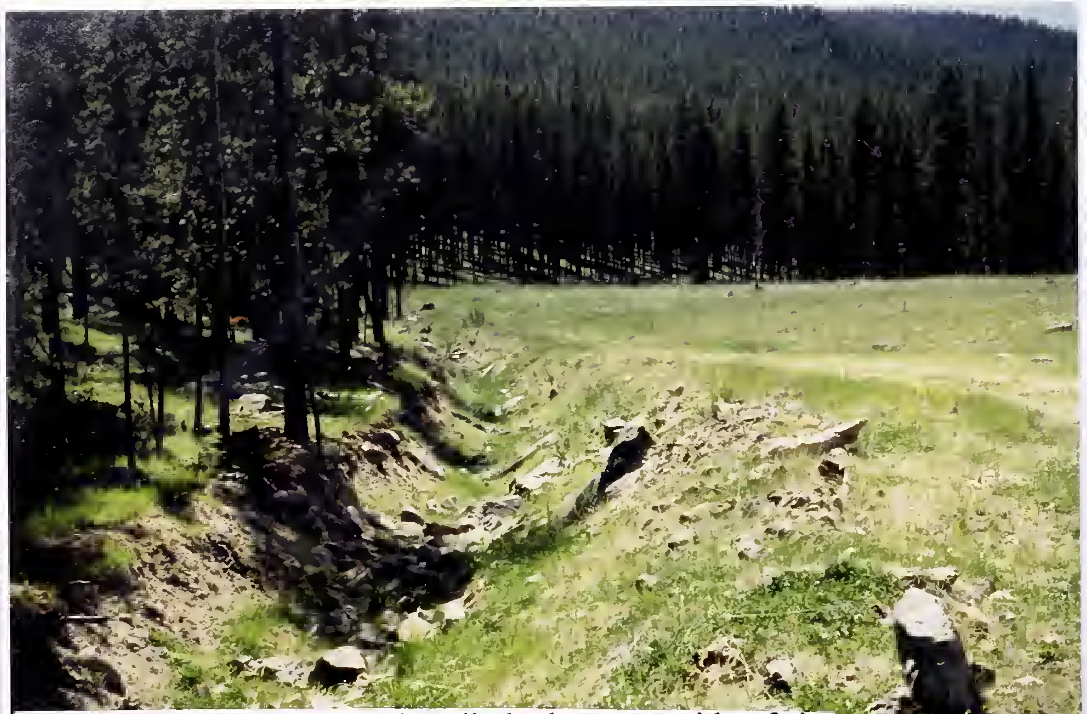
LINE NO.		SITE SAFETY		SITE NAME: Trumley Heap Leach PA NUMBER: 22-501
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	0
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		5
12		TARGETS SCORE	SUM LINES 9 THRU 11	5
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	0.00

22-501, #5: SW-1 sample location

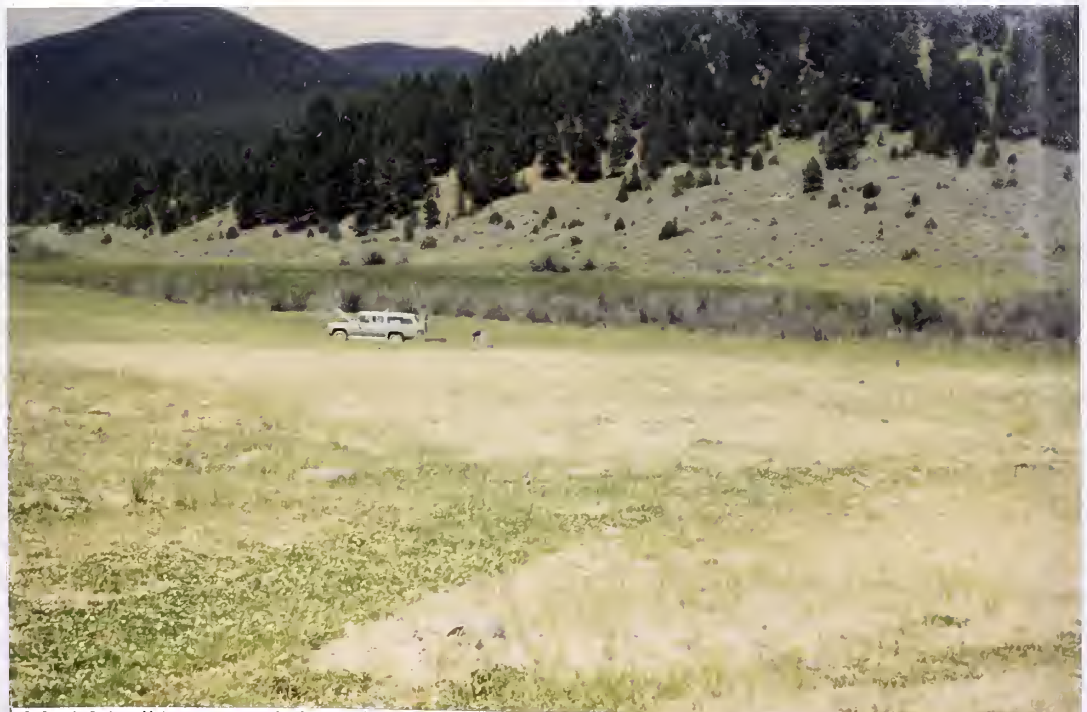
22-501, #6: SW-2 sample location

22-501, #7: Reclaimed area facing south

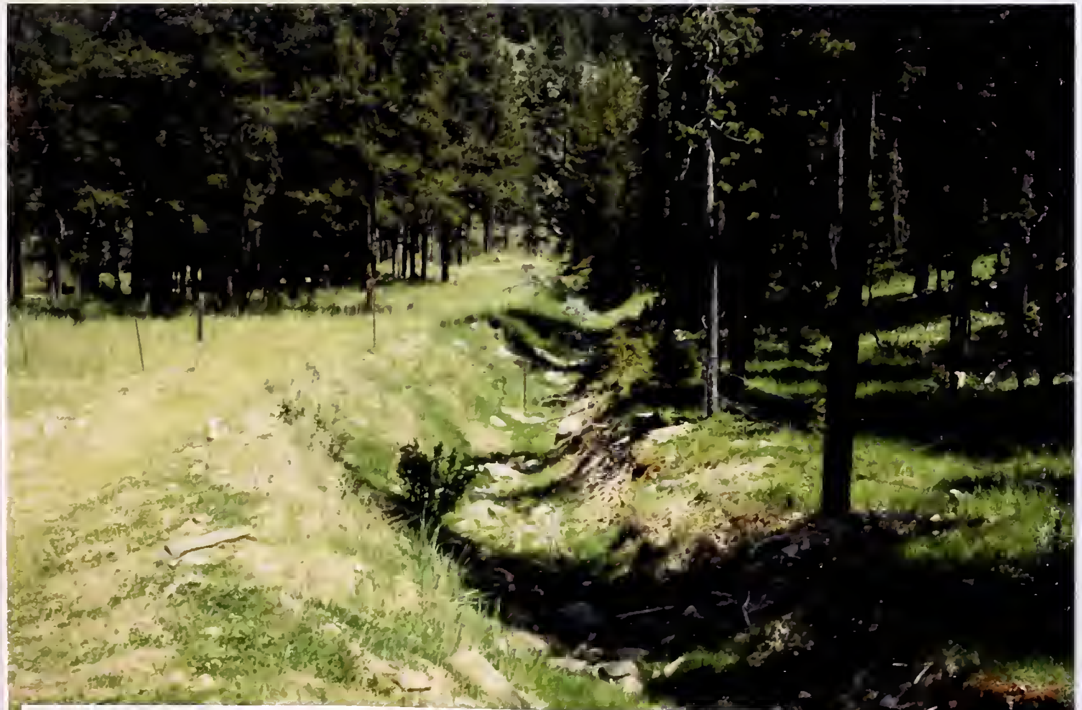

22-501, #8: Evidence of liner at site



22-501, #9: Run-on diversion ditch along east side of site



22-501, #10: Reclaimed area facing north



22-501, #11: Run-on diversion ditch facing northeast

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: ELKHORN CREEK TAILINGS **PA#:** 22-502

Date: August 8, 1994 **Time:** 0900-1530

Field Team Leader: Tuesday, Pioneer

Sampling Personnel: Belanger, West; Pioneer

Visitors: Dick Juntenen, Consultant for Santa Fe

Weather/Seasonality Observations: Cool; clear in morning; cloudy and windy in afternoon; dry, hot summer.

Photographic Log **(Film Roll and Photo No.'s/Video Tape Number):** #1: SW-1/SE-1 sample location facing north-northeast; #2: SW-2/SE-2 sample location facing north; #3: Toe/dam of TP-1 facing north-northeast, stream flows to the left through the dam; #4: Lower (south) end of TP-1 facing north from southwest corner and TP-1A sample location; #5: TP-1 facing southeast (1 of 4); #6: TP-1 and mill facing east (2 of 4); #7: Mill facing east (3 of 4); #8: Upgradient view with the town of Elkhorn in background (4 of 4); #9: SW-3/SE-3 sample location facing north, upgradient of site approximately 150 feet; #10: Overall of mill and TP-1 facing southeast; #11: TP-2 facing south-southwest (1 of 2); #12: TP-2 facing southwest (2 of 2); #13: North end of TP-2 and berm facing northwest; #14: South end of TP-2 and TP-2A sample location facing north; #15: Dam above TP-2 facing south; #16: Vegetated area upgradient of dam, TP-2B sample location in bottom corner. Video Tape No. 3

General Comments/Observations **(not covered specifically in attached Inventory Forms):** Large amount of reprocessed tailings along and in Elkhorn Creek below mill built in 1930s.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Move upper tailings away from creek, cover, and vegetate. Move lower tailings away from active creek, recontour, stabilize, and vegetate.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): ELKHORN CREEK TAILINGS **PA#:** 22-502

Legal Description: **T** 6N **;R** 3W **;Sec.** 15 **,** SE **1/4** E **1/2** ____ **1/4**

County: JEFFERSON **Mining District:** ELKHORN

Latitude: N 46° 10' 11" **Longitude:** W 111° 57' 18"

Primary Drainage Basin and Code: Elkhorn Creek/10020006
Secondary Drainage Basin: Elkhorn Creek

USGS Quadrangle map name(s): Elkhorn

Mine Type/Commodities: Hardrock/Gold

Activity Status: **Active** ____**, Inactive/Exploration** X **, Abandoned** ____.

Ownership: Known Y ____ **N** X **; private/public?** Private
Owner, Agent, or Contact **(Include address and phone when available):** Leased by Santa Fe Mining.

Relationship to other mines/sites in the area/district: Possible mill tailings from Elkhorn Mine ore. Presently controlled by Santa Fe Mining, as are the Carmody, Sourdough, and a few other mines in the area.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? Possible hardrock permit for Santa Fe Mining

General site features: Elevation 6200' **, Slope** 10° **,**
Aspect South

Land use: Mining X **, Recreational** X **, Residential** X **, Urban** ____**,**
Agricultural X **, Other(Specify)** ____

Area of disturbed/unvegetated lands? 6 **acre(s).**
Site Dimensions: 100 feet x 250 feet (upper); 300 feet x 800 feet (lower)

Predominant vegetation types: Willow, Engelmann spruce, Douglas fir

Access: roads - good (paved) ____**, poor (maintained dirt road)** X **,**
4wd ____**, trail** ____.
Other logistical considerations (proximity to other sites). Southwest of Carmody and Elkhorn; North of Queen 1 mile

Well logs within 1 mile radius; (Attach MBMG Well Log Printout(s): There are 12 wells reported within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site is along Elkhorn Creek, 0-10.5 miles; Boulder River, 10.5 to 15 miles. Site is underlain by limestones.

Mining/milling history, ore type/tenor, host rock, gangue: Lower mill reprocessed Elkhorn Mill tailings in the 1930s according to Santa Fe Mining Geologist, Paul Tietz.

Mine Operation?

Shafts - Yes___, No_X_, # _____, Comment

Adits - Yes___, No_X_, # _____, Comment

Pits - Yes___, No_X_, # _____, Comment

Placers - Yes___, No_X_, # _____, Comment

Other - Yes___, No_X_, # _____, Comment

Mill Operation? Yes_X_, No____. If yes answer the next three questions:

Period(s) of Operation: 1930s to 1940s

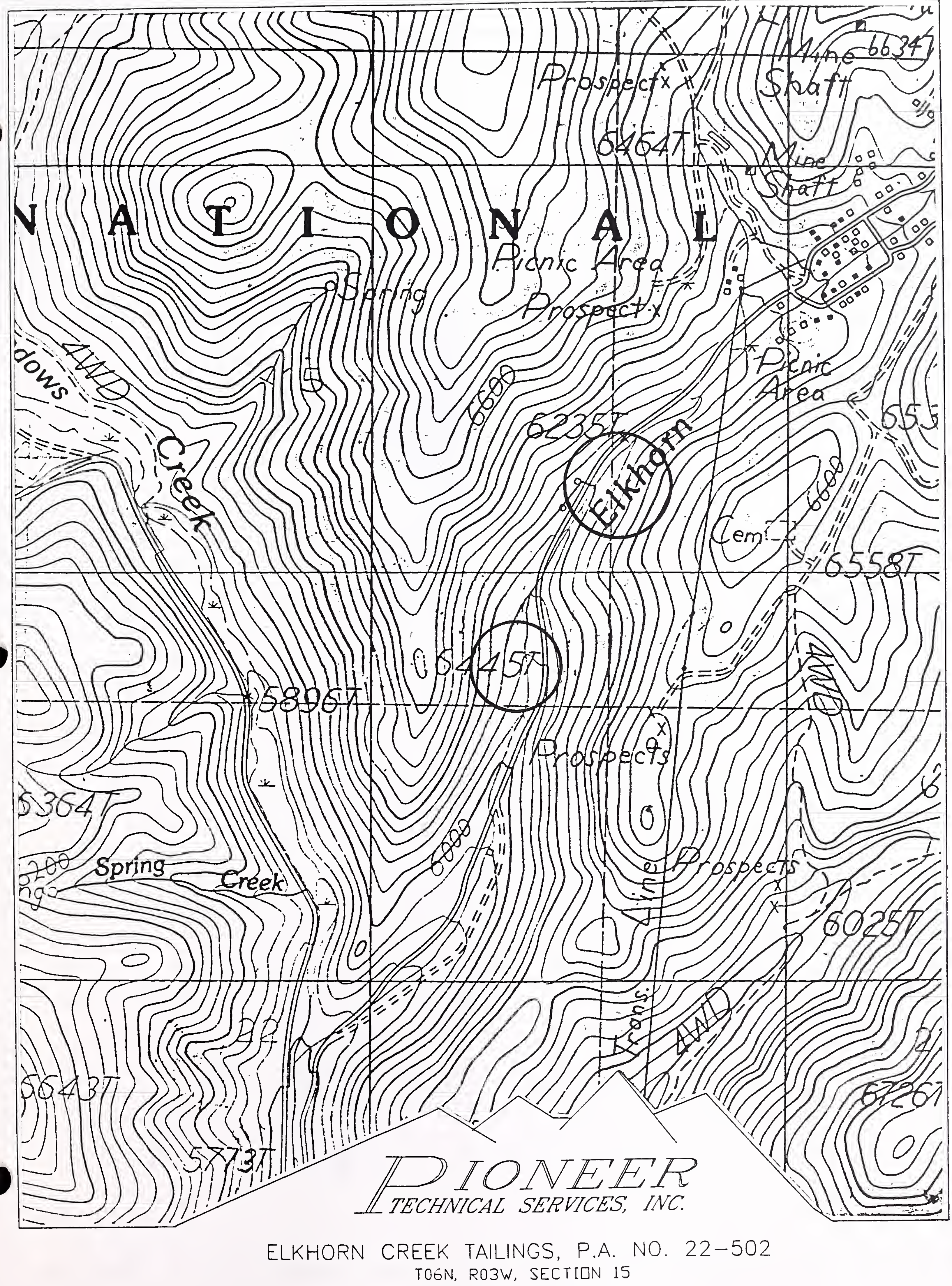
Origin of Ore Milled - Custom Mill___ Dedicated Mill_X_; Number and names of mines that supplied mill feed: Elkhorn Tailings upstream

Process? Hg-amalgam, CN⁻ leach (vat, heap), floatation, smelting?
Unknown

Montana Bureau of Mines and Geology
Water Well Log Data

08/18/1994

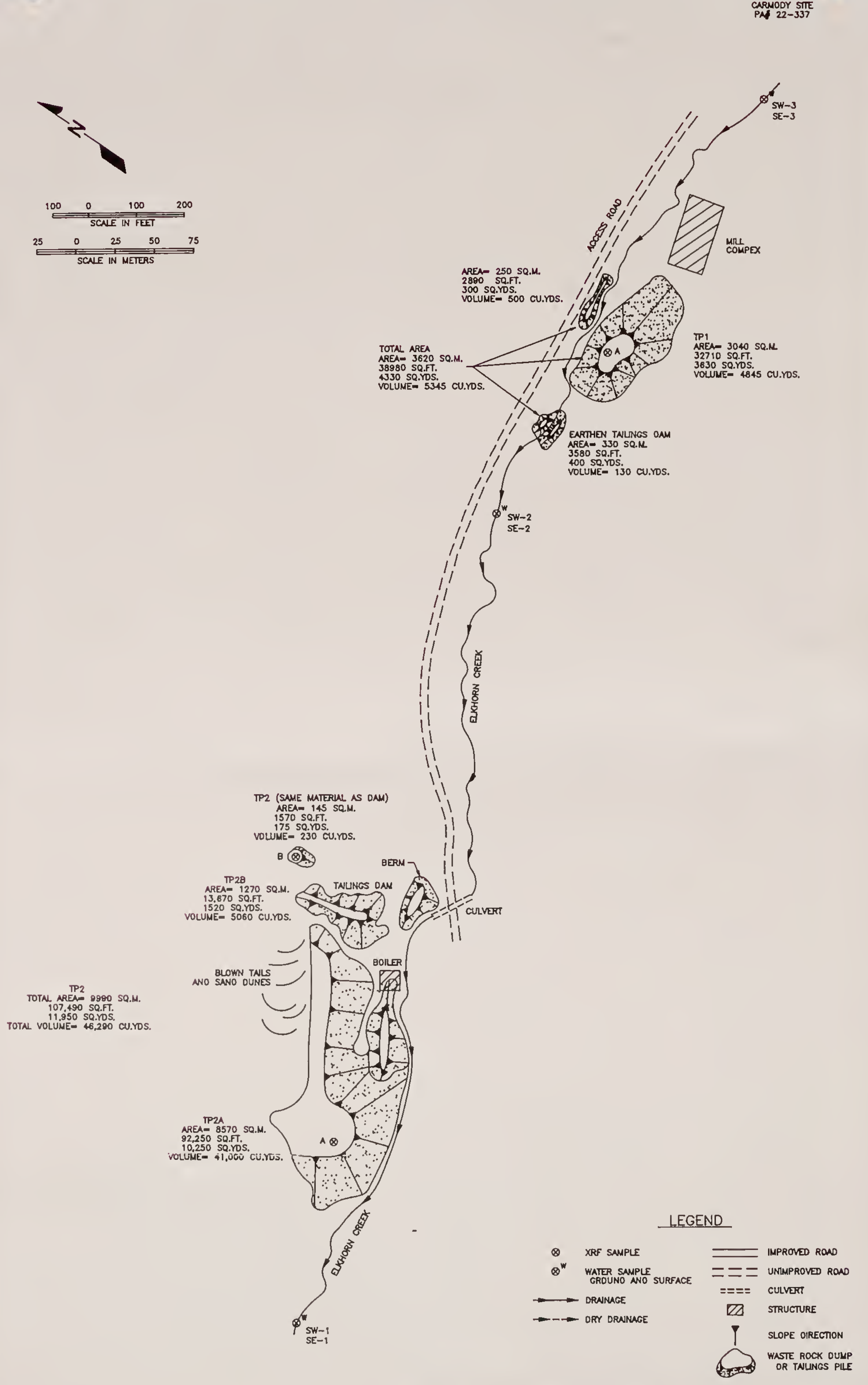
Well No.	Location	Depth	Yield	Static Water Level
M:53335	06N 03W 11 CC	155.0	90.0	25.00
[illegible]:53336	06N 03W 11 CD	180.0	60.0	25.00
M:53337	06N 03W 14	110.0	20.0	20.00
M:53338	06N 03W 14 BA	185.0	99.0	170.00
M:53341	06N 03W 15	84.0	4.0	15.00
M:53339	06N 03W 15	125.0	20.0	5.00
M:53340	06N 03W 15	64.0	30.0	10.00
M:53342	06N 03W 15 DAC	27.0	1000.0	15.00
M:5401	06N 03W 22 ABB	18.0	0.0	6.47
M:5399	06N 03W 22 ABB	78.0	0.0	8.49
M:5400	06N 03W 22 ABB	18.0	0.0	6.97
M:5402	06N 03W 22 ABB	65.0	0.0	6.37



ELKHORN CREEK TAILINGS, P.A. NO. 22-502

T06N, R03W, SECTION 15

SCALE: 1" = 1000'



DRAWN FOR:

PIONEER
TECHNICAL SERVICES, INC.

TITLE:
ELKHORN CREEK TAILINGS
PA# 22-502

DRAWING NO.: PT340237 REV: –
DATE: 11/30/94 PLOT SCALE: 1 = 60

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. **Waste Characteristics** - *Use table on following page.*

Unique source identification: (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures/vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. **TAILINGS IMPOUNDMENTS** - *If tailings impoundments are also present, complete the following questions.*

Describe the tailings grain size distribution (approximate % sand, silt, & clay): Fine sand and silt

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): Upper pond (TP-1) is not impounded; 16 feet deep at deepest point; lower 4 feet is wet with more clay and higher metal values. Lower pond (TP-2) is not impounded; 35 feet deep at deepest point; no stratification.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Lower 4 feet of TP-1 are wet; otherwise, dry. TP-2 is dry.

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): No impoundment intact; tailings are migrating.

Comments on potential for mitigation: May be able to impound tailings in place with amendments and revegetation. Channel stabilization may also be necessary.

SOURCE INVENTORY FORM

SAMPLERS: Belanger, West

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd³)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
TP-1A-1	TAIL	5,345	Southwest end of upper pond; 0-3'	None	5.2 (D)	0.03	22-502-TP-1	08/08/94 1715	T-Metals, ABA, Cyanide
TP-1A-2	TAIL		3-6'	None	4.8 (D)	0.03			
TP-1A-3	TAIL		6-9'	None	3.9 (D)	0.03			
TP-1A-4	TAIL		9-12'	None	3.6 (D)	0.03			
TP-1A-5	TAIL		12-15', wet	None	3.8 (D)	0.03	22-502-TP-2	08/08/94 1720	T-Metals, ABA, Cyanide
TP-1A-6	TAIL		15-16', wet	None	< 3.5 (D)	0.03			
TP-2A-1	TAIL	46,290	South end of lower pond; 0-5'	None	6.6 (D)	0.03	22-502-TP-3	08/08/94 1725	T-Metals, ABA, Cyanide
TP-2A-2	TAIL		5-10'	None	6.9 (D)	0.03			
TP-2A-3	TAIL		10-15'	None	6.7 (D)	0.02			
TP-2A-4	TAIL		15-20'	None	6.6 (D)	0.04			
TP-2A-5	TAIL		20-25'	None	5.7 (D)	0.025			
TP-2A-6	TAIL		25-30'	None	6.7 (D)	0.045			
TP-2B	TAIL		North end of lower pond	None	NM	NM	N/A	N/A	XRF Analysis

*D-Direct reading (Kelway Meter); S-Saturated Paste (Orion Meter)

Comments or deviations from SOPs: 22-502-TP-1 is composite of TP-1A-1 through -1A-4. 22-502-TP-2 is composite of TP-1A-5 and -1A-6. 22-502-TP-3 is composite of TP-2A-1 through -2A-6. NM = Not Measured. See Trumley Heap Leach (22-501) for background soil sample.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No_X_, Number:____ Identification:____________

Filled shafts: Yes___, No_X_, Number:____ Identification:____________

Seeps/Springs: Yes___, No_X_, Number:____ Identification:____________

Groundwater wells within 4 miles?: Yes_X_, No___;
Number of well logs: 23

Distance to nearest well used for drinking:
___<1,000 ft; _X_ 1,000 ft to 0.5 miles; ___>0.5 miles.

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable____, Possible_X_, Unlikely____.
Large uncontained source in alluvial valley; TP-1 has groundwater at 14 feet bgs.

Approximate Depth to Groundwater: _X_ <25 ft; ___ 25 - 100 ft; ___ >100 ft.

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

SAMPLERS: ____________________

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC $\mu S/cm$ @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.												

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ____________________

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: **Yes** X, **No** ___, **Name(s):** Elkhorn Creek

Dry streambeds: **Yes** ___, **No** X, **Name(s):** ___

Other surface water: **Yes** ___, **No** X, **Name(s)/Description:** ___

Waste materials within any floodplain: **Yes** X, **No** ___ **Source ID(s):** TP-1 and TP-2

Approximate Flood frequency? X **1 yr,** ___ **10 yr,** ___ **100 yr**

Estimated seasonal flow of stream(s) (cfs/gpm)? 0.4 cfs
High Flow: 2.0 cfs, **Average Flow:** 0.4 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: **Yes** X, **No** ___,
Describe: Elkhorn Creek flows through TP-1; streambanks are composed of tailings.

Surface water use within 15 miles downstream? **(Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)**
Agriculture, irrigation, wetlands

Observed erosional/sedimentation/stream turbidity problems? Yes X, **No** ___. **Distance downstream (ft)? 0-500** ___; **500-1,000** ___; **>1,000** X.
Describe/explain **(Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):** Tailings in streambed downstream 2,000 feet. Channel has been moved between TP-1 and TP-2 to the east.

SURFACE WATER INVENTORY FORM

SAMPLERS: Belanger

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC $\mu S/cm$ @ 25°C	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	Downstream Elkhorn Creek, below TP-2	6.6	282	9.9	125	0.41 cfs (M)	22-502-SW-1	08/08/94 1045	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-1	SE	Downstream Elkhorn Creek, below TP-2	N/A	N/A	N/A	N/A	N/A	22-502-SE-1	08/08/94 1045	T-Metals
SW-2	SW	Midstream Elkhorn Creek, between TP-1 and TP-2	4.88	251	10.5	115	0.38 cfs (M)	22-502-SW-2	08/08/94 1100	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-2	SE	Midstream Elkhorn Creek, between TP-1 and TP-2	N/A	N/A	N/A	N/A	N/A	22-502-SE-2	08/08/94 1100	T-Metals
SW-3	SW	Upstream Elkhorn Creek, above TP-1	6.34	233	11.0	113	0.33 cfs (M)	22-502-SW-3	08/08/94 1200	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-3	SE	Upstream Elkhorn Creek, above TP-1	N/A	N/A	N/A	N/A	N/A	22-502-SE-3	08/08/94 1200	T-Metals

*FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ____________________

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides? *(SO_3)*

Presence of evaporative salt deposits? *(ESD)*

Discolored or turbid seepage? *(SPG)*

Presence of long filamentous algae in drainages, mosses in moist areas?

Presence of ferric hydroxide precipitates? *(FEOX)*

Presence of burned or stressed vegetation? *(VEG)*

$pH \leq 5.0$ *(pH)*

General Potential for AMD Mitigation:

Area available for treatment (acres)? 5 acres

Wetlands present: Yes _X_, **No** ___, **Describe:** Minor

Carbonate rocks/soils: Yes _X_, **No** ___, **Describe:** Limestone bedrock

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30 _X_**; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments**

Nearest residence:___<1,000 ft; _X_ **1,000 ft - 0.5 miles;___>0.5 miles.**

For each source (table next page):

Available fine materials? *Surface area?*

Uncovered and unvegetated? *Wet or dry?*

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Belanger, West

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
TP-1	pH; ESD	Dry	38,980	35,080	Yes	High
TP-2	None	Dry	107,490	107,490	Yes	Observed - dust and dunes

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes_____, No_X_
Describe:____________________

Population within 1 mile: 1-10___; 10-30_X_; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments____________________

Evidence of recreational use on site: Yes_X_, No_____, Describe: Campfire rings; tire tracks; garbage; site is 500 to 1,000 feet below (south) USFS picnic area.

Accessibility (check each that apply):_X_Easily accessible - no fences, gates, or warning signs;___Moderately Accessible - barbed wire fences, road gated, or signs posted;___Difficult Access - chain-link fence, road gated and locked, site guarded (does not include locked or manned access points located more than 0.5 miles from the actual site).

Sensitive environments on-site or adjacent to site:
State or National Parks - Yes___, No_X_, Comment__________
Wilderness Area - Yes___, No_X_, Comment__________
T&E Species Habitat - Yes___, No_X_, Comment__________
Bat Habitat - Yes___, No_X_, Comment__________

Primary Drainage___; Secondary Drainage_X_; No Information___:
Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium_X_, Low___
Fisheries Habitat and Species Classification - _4_
Sport Fishery Classification - _4_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes___, No_X_, Number____, types and locations:__________

Hazardous structures: Yes_X_, No___, Number_1_, types and locations: Mill building by TP-1

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____, types and locations:__________

Unstable waste piles, impoundments, undercut banks: Yes_X_, No____, Number_1_, types and locations: Creek undercutting TP-1

Fire and/or Explosion hazards: Yes___, No_X_, Explain:__________

Bibliography

MBMG, Well Log Database, July 14, 1994.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

USGS, Topographic Map, Elkhorn, Montana, 7 1/2 minute Quadrangle, 1985.

LABORATORY ANALYTICAL DATA

ELKHORN CREEK TAILINGS
PA NO. 22-502

Elkhorn Creek Tailings PA# 22-502
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 08/08/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-502-SE1	54.8	164	22.2	89.8	3.5	4.4	332	10300	26.9	1380	6.1 J	3510	225	9440	NR
22-502-SE2	63.2	165	19.4	79.9	3.5	4.1	340	10200	40.2	1370	5.0 J	3590	226	9260	NR
22-502-SE3	93.0	159	37.7	38.1	8.5	8.0	409	26800	44.3	384	7.8 J	3190	209	11400	NR
22-502-TP1	86.4	320	24.0	180	2.9	4.0	601	11300	5.45	2580	6.7 J	5910	430	14800	8.16
22-502-TP2	74.5	448	32.2	229	4.1	4.9	687	14900	9.36	3200	10.3 J	8800	484	18400	10.8
22-502-TP3	54.1	189	10.0	134	3.2	2.9	323	7330	1.71	1690	3.3 J	3380	256	12300	1.91
BACKGROUND	0.5 U	21.3	267	0.5 U	9.3	15.0	13.9	17400	0.05	1410	11.1	17.7	5.8 UJ	85.8 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-502-TP1	0.15	4.69	198	193	0.01	0.08	0.06	2.50	196
22-502-TP2	0.35	10.9	200	190	0.35	<0.01	0.01	0.00	200
22-502-TP3	0.17	5.31	204	199	0.02	<0.01	0.21	0.00	204

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-502-SW1	0.22 JX	10.7	19.4	9.8	8.4 U	6.8 U	8.7	77.9 J	0.76	43.2 J	14.4 U	86.2 J	51.6 U	299	148
22-502-SW2	0.15 JX	9.2	15.6	6.6	8.4 U	6.8 U	9.5	108 J	0.36	34.4 J	14.4 U	66.4 J	51.6 U	181	141
22-502-SW3	0.32 JX	9.5	12.7	4.0 U	8.4 U	6.8 U	7.0	98.0 J	0.30	8.8 J	14.4 U	16.0 J	51.6 U	21.1	126

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-502-SW1	121	<5.0	19	0.19	NR
22-502-SW2	125	<5.0	12	0.09	NR
22-502-SW3	100	<5.0	6	<0.05	NR

LEGEND

SE1 - Downstream Elkhorn Creek; below TP2.
SE2 - Midstream Elkhorn Creek; between TP1 and TP2.
SE3 - Upstream Elkhorn Creek; above TP1.
TP1 - Composite of subsamples TP1A-1 through 1A-4.
TP2 - Composite of subsamples TP1A-5 and 1A-6.
TP3 - Composite of subsamples TP2A-1 through 2A-6.
BACKGROUND - From the Trumley Heap Leach (22-501-SS1).

SW1 - Same as sample 22-502-SE1.
SW2 - Same as sample 22-502-SE2.
SW3 - Same as sample 22-502-SE3.

XRF ANALYSIS RESULTS

ELKHORN CREEK TAILINGS
PA NO. 22-502

Mine Name: Elkhorn Creek Tailings PA# 22-502
XRF Field Analyses
Results In PPM

XRF SAMPLE I.D.	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Ni	Cu	Zn	As	Sr
22-502-TP1A1		11550 $	130320 $	458 $	103 $	3970 $	12900 $		65 $	494 $	14520 $		62.4 $
22-502-TP1A2		10030 $	116550 $	348 $	173 $	3220 $	12530 $		153 $	525 $	13550 $		50.6 $
22-502-TP1A3		9450 $	111830 $	367 $	215 $	3350 $	11860 $		153 $	370 $	13100 $		62 $
22-502-TP1A4		7960 $	121940 $	271 $	292 $	3240 $	11310 $		94 $	422 $	12160 $		54.1 $
22-502-TP1A5		18100 $	119940 $	759 $	105 $	5000 $	19750 $		166 $	677 $	19310 $		61.1 $
22-502-TP1A6		18750 $	121970 $	810 $	89 $	5160 $	19770 $		179 $	709 $	20810 $		74.4 $
22-502-TP1-COMP		11421.6	124773	423.748 *		3388	13187.1			387.533 *	13999.7		70.9784
22-502-TP2A1		4290 $	146000 $	259 $	273 $	1960 $	6660 $		143 $	75 $	7930 $		46.5 $
22-502-TP2A2		21270 $	137760 $		2460 $	2570 $	6170 $	390 $	254 $	438 $	8170 $		48.4 $
22-502-TP2A3	330 $	9380 $	126670 $	209 $	639 $	2470 $	6480 $	99 $	235 $	314 $	7700 $		41.7 $
22-502-TP2A4		8430 $	131790 $	195 $	482 $	2300 $	9110 $		122 $	123 $	10280 $		53.4 $
22-502-TP2A5		8168.75	137303		453.383 *	2242.22	7511.53			264.51 *	9504.44		54.0601
22-502-TP2A6		15398.2	126693		1674.87	2628.06	6791.22			262.101 *	7192.55		51.9947
22-502-TP2B		10997.8	42623	824.978		2725.36	35116.4		415.761 *	2146.97	38422.2		81.4129 *
22-502-TP2-COMP		17290.7	128513	696.596 *		4865.57	17610.1			625.753	18202.1		63.2115 *
22-502-TP3-COMP		6176	147095	215.824 *	313.195 *	2892.29	8206.63			105.603 *	9213.06		56.5778
22-502-TP3-COMP-DUP		5800.14	147471	291.562 *	318.161 *	2644.08	7966.56			115.124 *	9166.55		56.7246

XRF SAMPLE I.D.	Zr	Hg	Mo	Pb	Rb	Cd	Sn	Sb	Ba	Ag	U	Th
22-502-TP1A1	71.3 $			5344 $	48.8 $	296 $		1493 $	37 $	126 $		14.6 $
22-502-TP1A2	58.8 $			4857 $	44.6 $	135 $	58 $	1278 $		108 $		10.8 $
22-502-TP1A3	50 $			4623 $	27.7 $	144 $		1238 $	16 $	180 $		21.8 $
22-502-TP1A4	55.6 $			4344 $	46.8 $	338 $		1284 $		224 $		24.3 $
22-502-TP1A5	98.8 $			8770 $	77 $	542 $		2780 $		221 $		43.7 $
22-502-TP1A6	82.9 $			9790 $	94 $	525 $	141 $	3033 $		263 $		26.6 $
22-502-TP1-COMP	51.7776			4971.07	35.1503 *	272.539 *		1406.67		138.457 *		23.6646 *
22-502-TP2A1	32.1 $			1443 $	15.1 $	84 $		468 $		104 $		13.7 $
22-502-TP2A2	29.8 $	190 $		1365 $	15.1 $			456 $		64 $		35.8 $
22-502-TP2A3	34.7 $	100 $		1360 $	26.2 $	115 $		469 $		60 $		29.6 $
22-502-TP2A4	42.5 $			1741 $	15.8 $	180 $	41 $	515 $		69 $		10.4 $
22-502-TP2A5	32.9507 *			2360.01	38.897 *	165.281 *		902.313		159.31 *		37.4682 *
22-502-TP2A6	41.2597			1385.21	31.5125 *			447.549		114.587 *		23.8912 *
22-502-TP2B	57.8975 *	525.068 *		25796.7	118.882 *	362.858 *		5647.36		356.972 *		123.623 *
22-502-TP2-COMP	88.1265			7806.73	80.5545 *	465.452 *		2365.2		164.779 *		27.0959 *
22-502-TP3-COMP	32.2657 *			1607.89		290.805 *		617.533				18.0947 *
22-502-TP3-COMP-DUP	34.0484			1648.73		276.275 *		622.475		132.455 *		

* = Estimated Quantity

$ = Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)
SCORESHEET

ELKHORN CREEK TAILINGS
PA NO. 22-502

AIMSS SCORESHEET

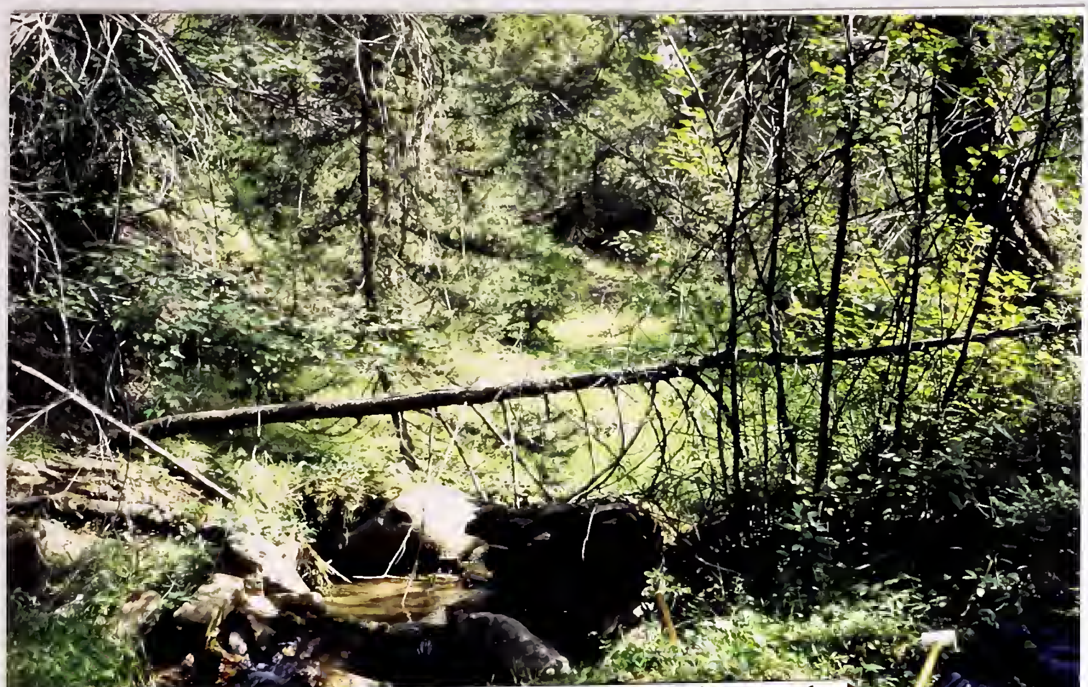
SITE NAME: Elkhorn Creek Tailings
PA NUMBER: 22-502

LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	148.237
6	GW - TARGETS	WELLS - 1 MI. x 2.5		30.0
7		WELLS - 1 TO 4 MI		11
8		NEAREST WELL		5
9		TARGETS SCORE	LINES 6 + 7 + 8	46.0
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	2727561
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		300
12		EXCEEDENCES		100
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	800
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	164.022
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		2
18		WETLANDS		10
19		FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	20
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	2624352
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		200
26A		CONTAINMENT		20
26B		DISTANCE TO POPULATION		10
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	200
27		LIKELIHOOD SCORE	LINES 25 + 26C	400
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	5.102
29	AIR - TARGETS	POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		5
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	25
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	51020
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		50
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		10
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	200
38		LIKELIHOOD SCORE	LINES 36 + 37C	250
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	4.610
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		10
41		NEAREST RESIDENCE		5
42		RECREATIONAL USE		10
43		TARGETS SCORE	SUM LINES 40 THRU 42	25
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	28813
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE	(LINES 10 + 24 + 35 + 44) / 100,000		54.32

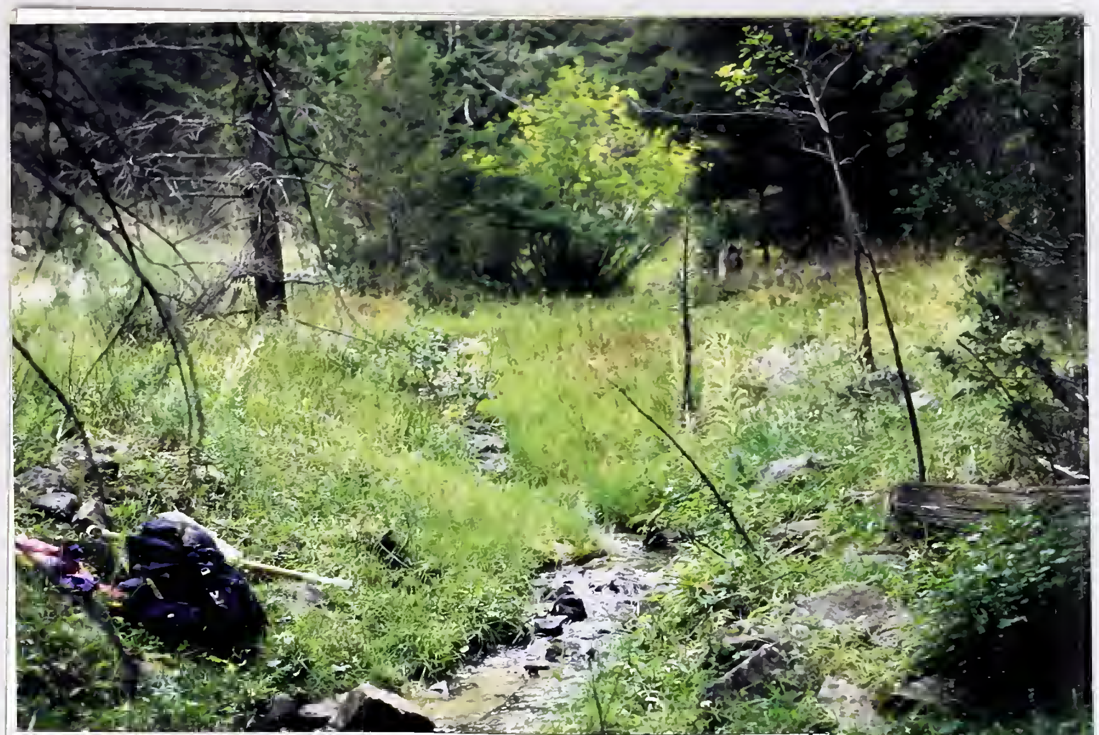
SITE NAME: Elkhorn Creek Tailings
PA NUMBER: 22-502

SITE SAFETY

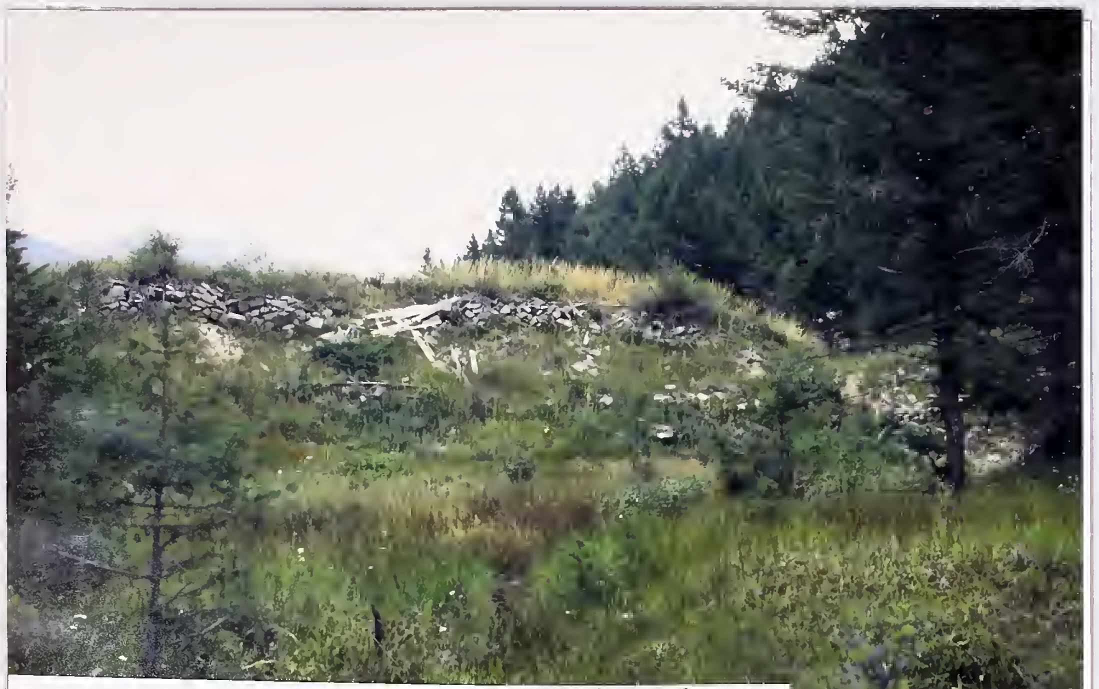
LINE NO.				
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	40
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	40
9		POPULATION - 1 MILE		10
10	TARGETS	NEAREST RESIDENCE		5
11		RECREATIONAL USE		10
12		TARGETS SCORE	SUM LINES 9 THRU 11	25
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	20.00



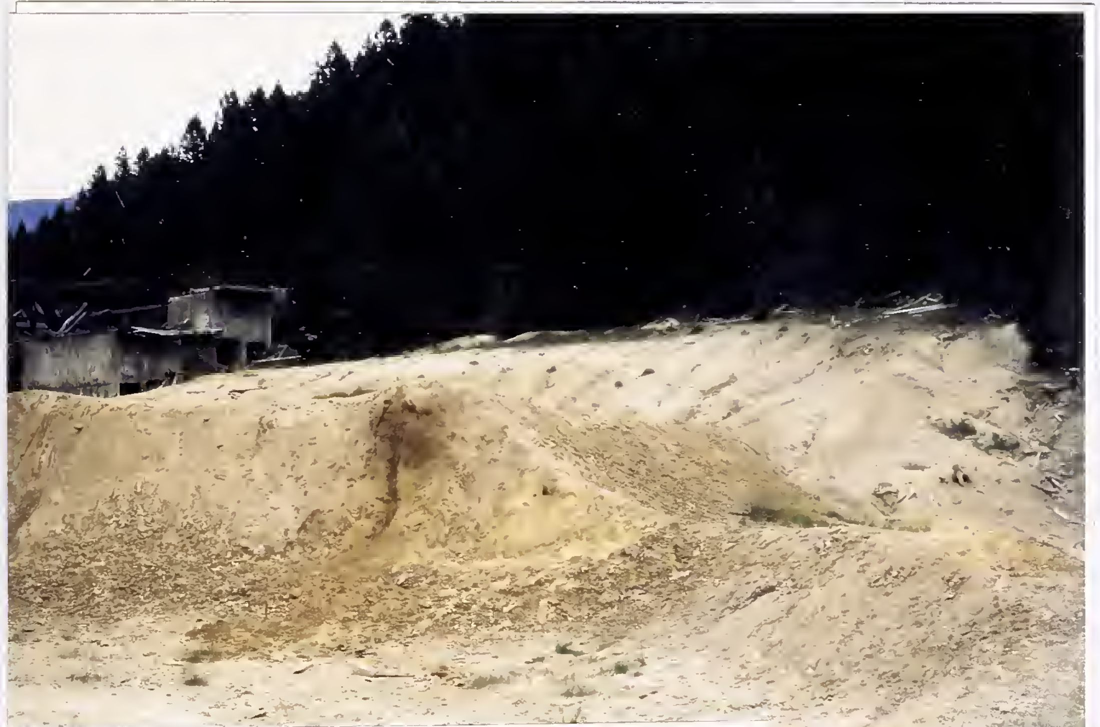
22-502, #1: SW-1 and SE-1 sample location facing north-northeast



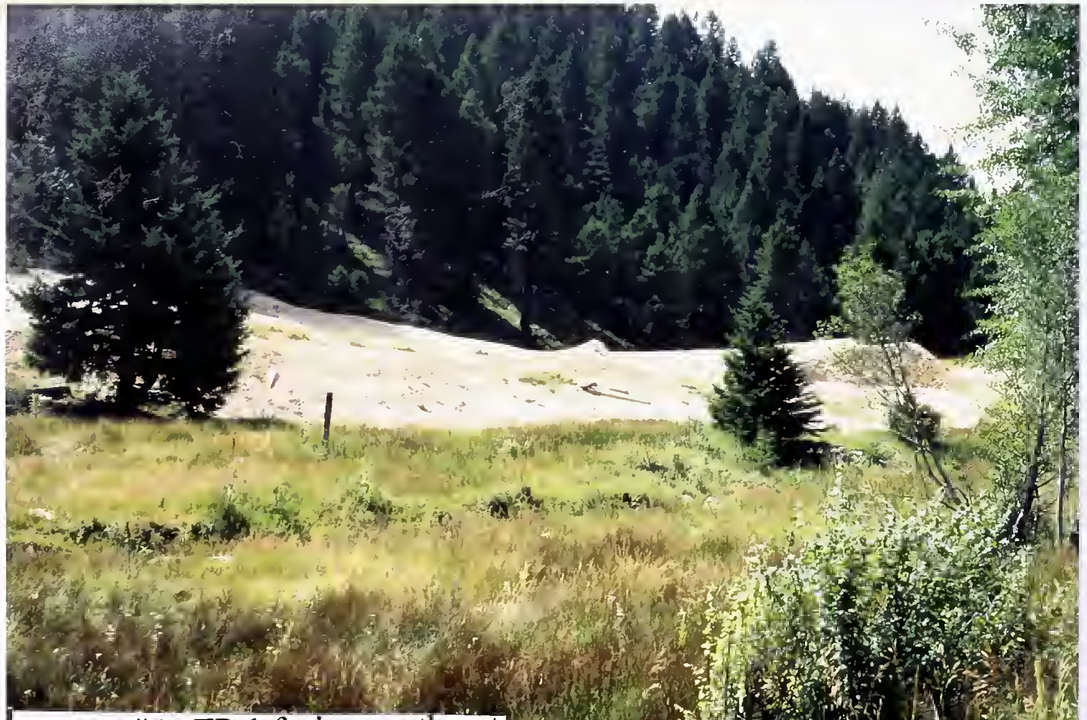
22-502, #2: SW-2 and SE-2 sample location facing north



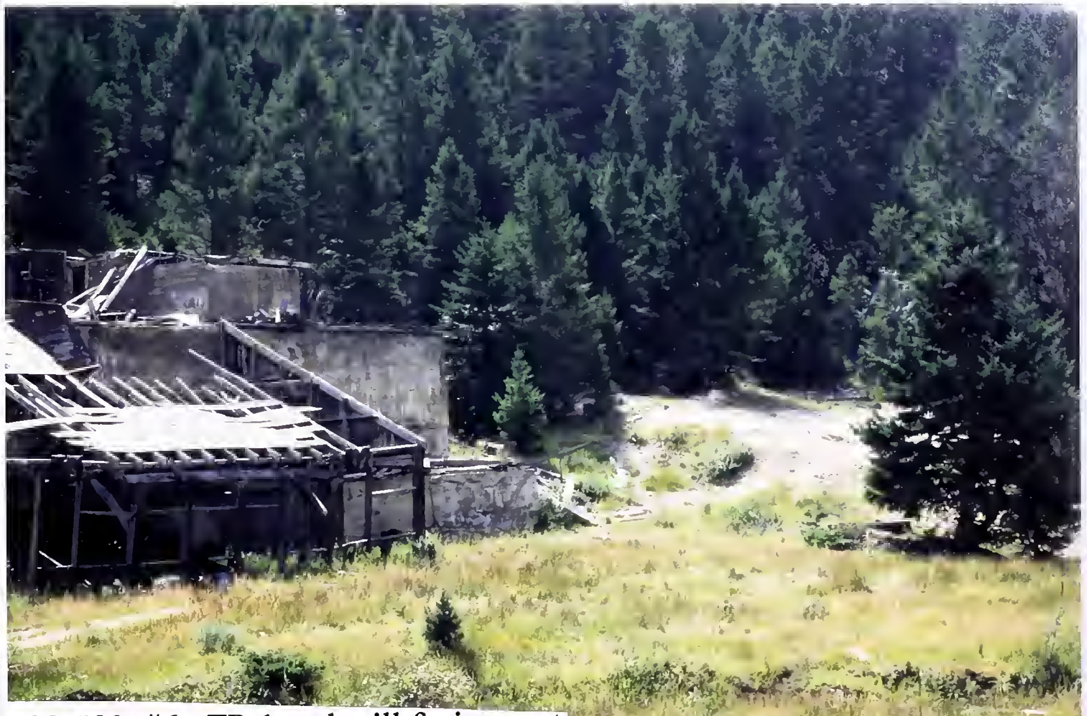
22-502, #3: Toe/dam of TP-1 facing north-northeast; stream flows to the left through the dam



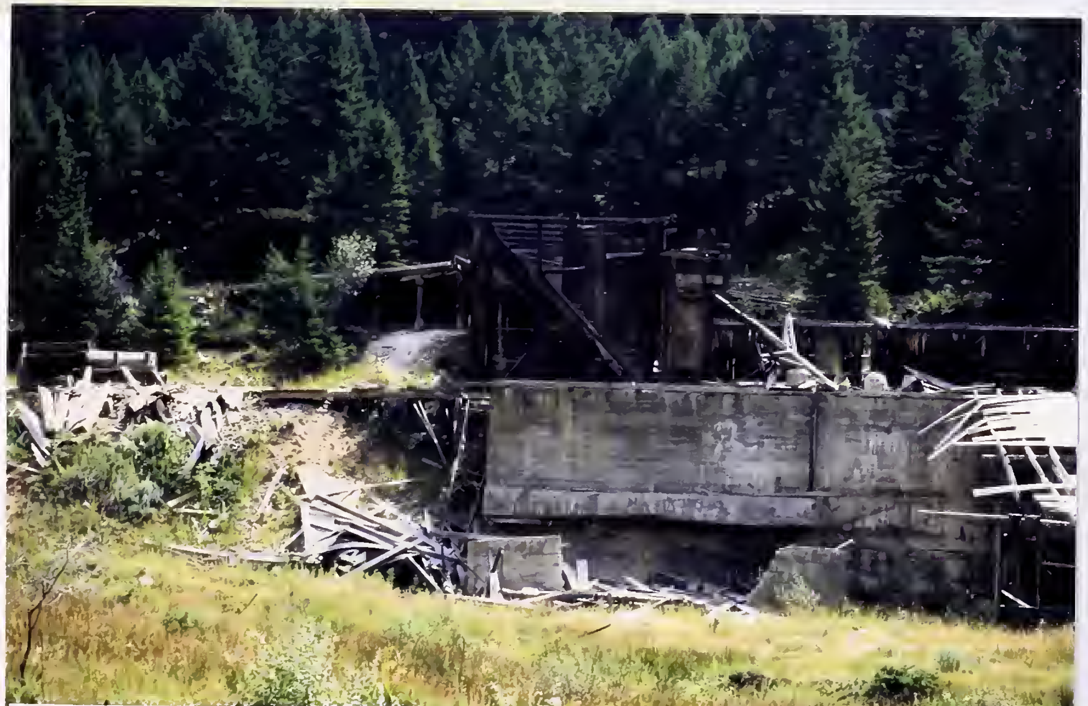
22-502, #4: South end of TP-1 and mill facing north



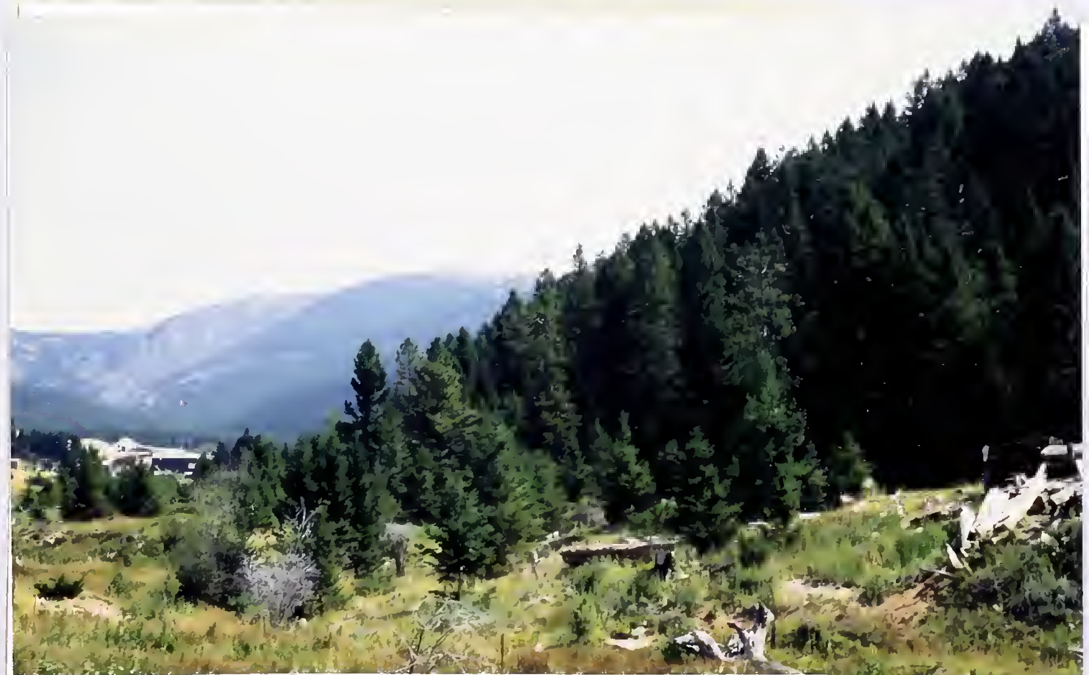
22-502, #5: TP-1 facing southeast



22-502, #6: TP-1 and mill facing east



22-502, #7: Mill facing east



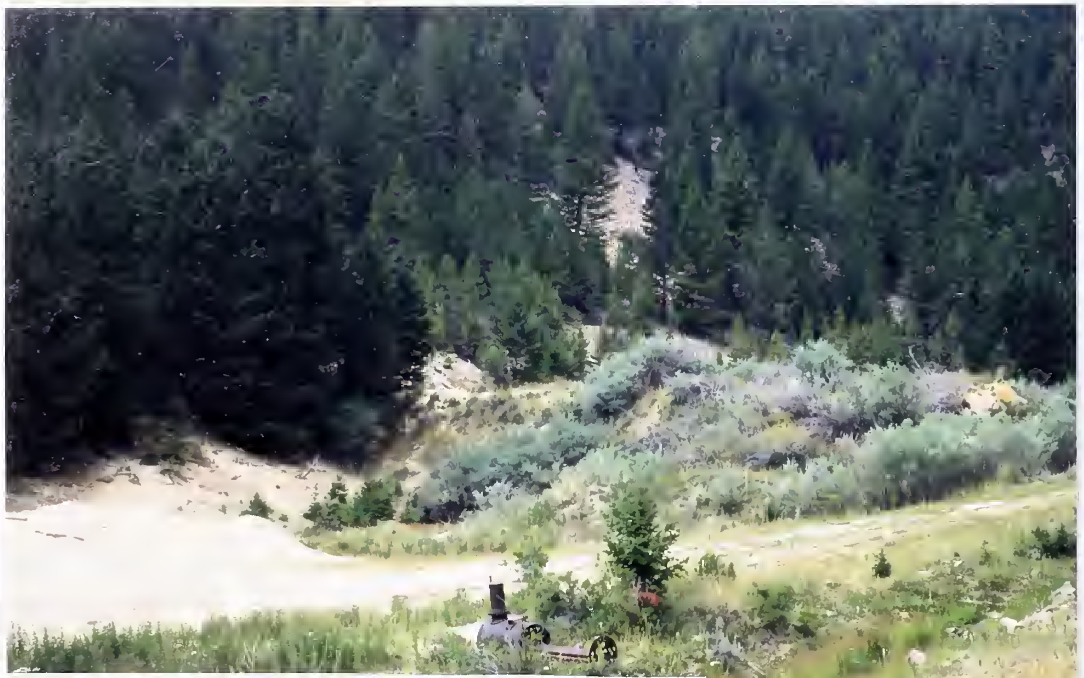
22-502, #8: Upgradient view with the town of Elkhorn in the background

22-502, #9: SW-3 and SE-3 sample location facing north

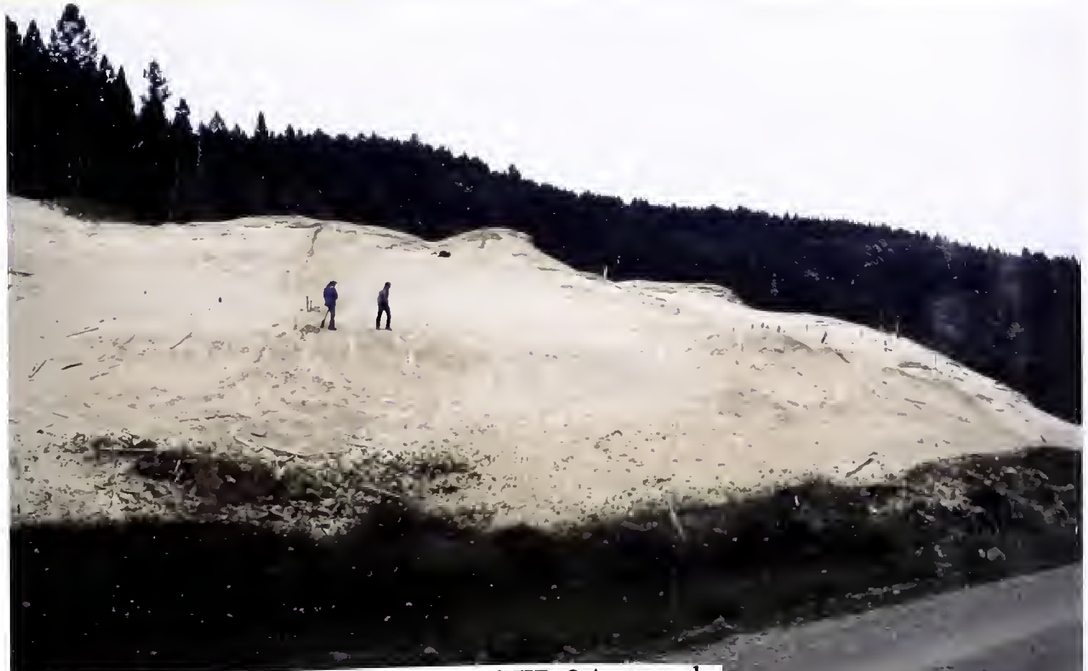
22-502, #10: Mill area and TP-1 facing southeast

22-502, #11: TP-2 facing south-southwest

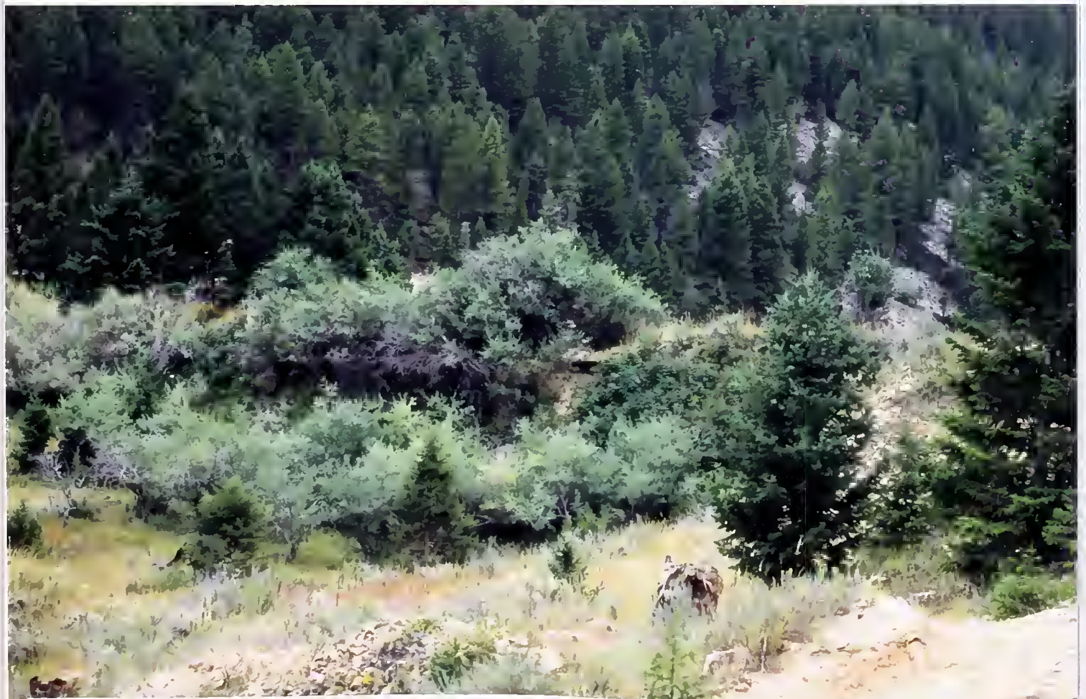
22-502, #12: TP-2 facing southwest



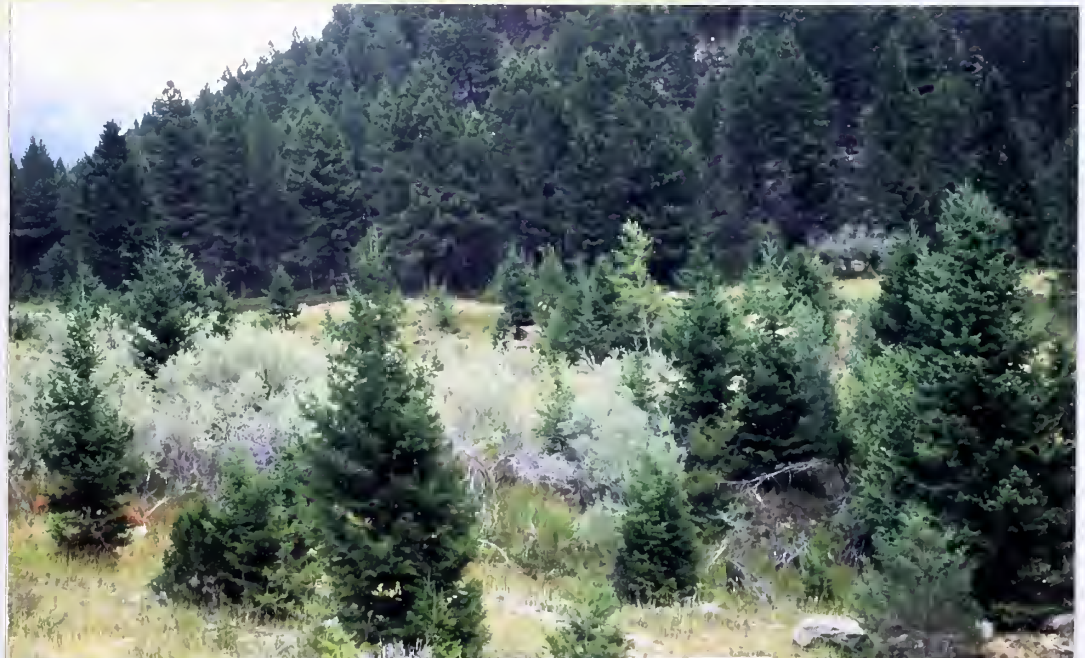
22-502, #13: North end of TP-2 and berm facing northwest



22-502, #14: South end of TP-2 and TP-2A sample location facing north



22-502, #15: Dam above TP-2 facing south



22-502, #16: Vegetated area upgradient of dam; TP-2B sample location in bottom corner

HUGHESVILLE

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: DANNY T **PA#:** 23-500

Date: July 11, 1994 **Time:** 0830-1015

Field Team Leader: Tuesday, Pioneer

Sampling Personnel: Bisch, West; Pioneer

Visitors: None

Weather/Seasonality Observations: Clear; cool; sunny.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #13: Adit #1 discharge; #14: Shed and discharge; #15: East end of WR-1 and shed; #16: Center of WR-1; #17: West end of WR-1; #18: Discharge down dump; #19: SW-1 sample location below Danny T and above Marcelline. Video Tape No. 3

General Comments/Observations (not covered specifically in attached Inventory Forms): Site is also referred to as "Jimmy T" by Chen-Northern in previous inventory. Surface water data collected during the 1993 investigation of the Marcelline site (23-022) demonstrates impacts from the adit discharge to Galena Creek.

Other Hazardous Materials/Substances Present: Empty barrels labeled "SAE 30"; hydrocarbon staining on dump where barrels have leaked.

General Comments on Potential Remedial Alternatives: Treat and route discharge more permanently to run around dump rather than through it. Stabilize slope of dump and reclaim.

MDSL AMRB/PIONEER 5/16/94

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): DANNY T **PA#:** 23-500

Legal Description: **T** 15N **;R** 9E **;Sec.** 7 , SE **1/4** NW **1/4** ___ **1/4**

County: JUDITH BASIN **Mining District:** HUGHESVILLE

Latitude: N 47° 04' 39.7" **Longitude:** W 110° 38' 0.7"

Primary Drainage Basin and Code: Dry Fork Belt Creek/10030105
Secondary Drainage Basin: Galena Creek

USGS Quadrangle map name(s): Barker

Mine Type/Commodities: Hardrock/Silver, Lead, Zinc

Activity Status: **Active** ___, **Inactive/Exploration** ___, **Abandoned** X .

Ownership: Known Y ___ **N** X ; **private/public?** Private
Owner, Agent, or Contact (Include address and phone when available)**:** Unknown

Relationship to other mines/sites in the area/district: Above Marcelline; south of Block P; north of Lucky Strike.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? N/A

General site features: Elevation 5900' , **Slope** 35° , **Aspect** West

Land use: Mining ___, **Recreational** X , **Residential** ___, **Urban** ___, **Agricultural** ___, **Other(Specify)** ___

Area of disturbed/unvegetated lands? 1.5 **acre(s).**
Site Dimensions: 300 feet x 200 feet

Predominant vegetation types: Douglas fir, Lodgepole pine, huckleberry, kinniKnick

Access: roads - good (paved) ___, **poor (maintained dirt road)** X , **4wd** ___, **trail** ___.
Other logistical considerations (proximity to other sites). Gated road above Belt Patent may come out at Danny T.

Well logs within 1 mile radius; **(Attach MBMG Well Log Printout(s):** There are no wells reported within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings **(Also note presence of radioactive minerals).** Adit discharge, as well as runoff from the site, flows west across the site to Galena Creek approximately 75 feet below. Galena Creek flows south away from the site to confluence with Dry Fork Belt Creek 2 miles downstream. Dry Fork Belt Creek flows west to confluence with Belt Creek 11 miles away. Deposits are lenses in Barker porphyry along a contact with pophyritic syenite and granite.

Mining/milling history, ore type/tenor, host rock, gangue: No mining history available. Gangue is quartz and calcite. Ore minerals are galena, covellite, tetrahedrite, and polybasite.

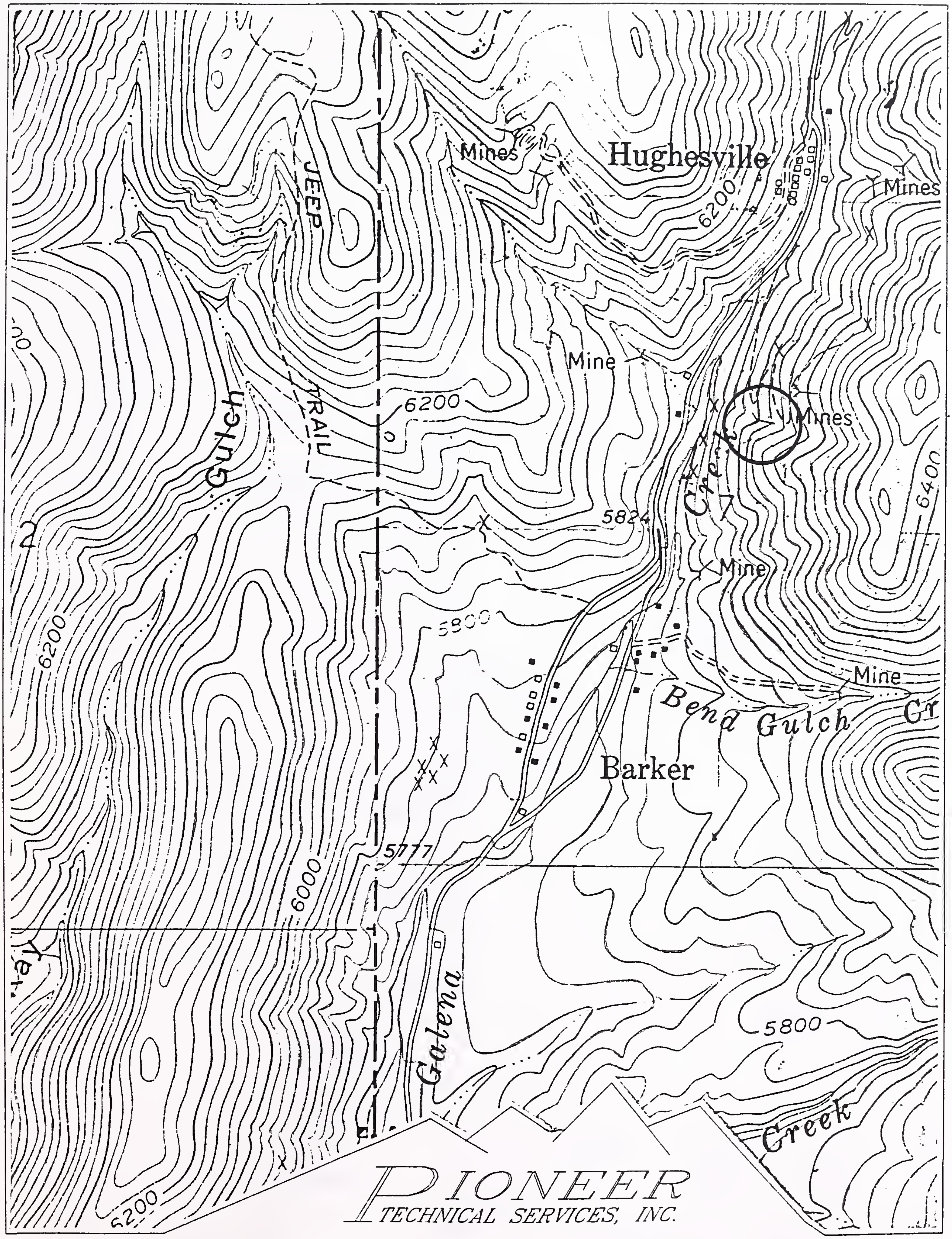
Mine Operation?
Shafts - **Yes**___, **No** X , **#** ____, **Comment**
Adits - **Yes** X , **No**___, **#** 1 , **Comment** Gated and locked
Pits - **Yes**___, **No** X , **#** ____, **Comment**
Placers - **Yes**___, **No** X , **#** ____, **Comment**
Other - **Yes**___, **No** X , **#** ____, **Comment**

Mill Operation? **Yes**____, **No** X . **If yes answer the next three questions:**

Period(s) of Operation: N/A

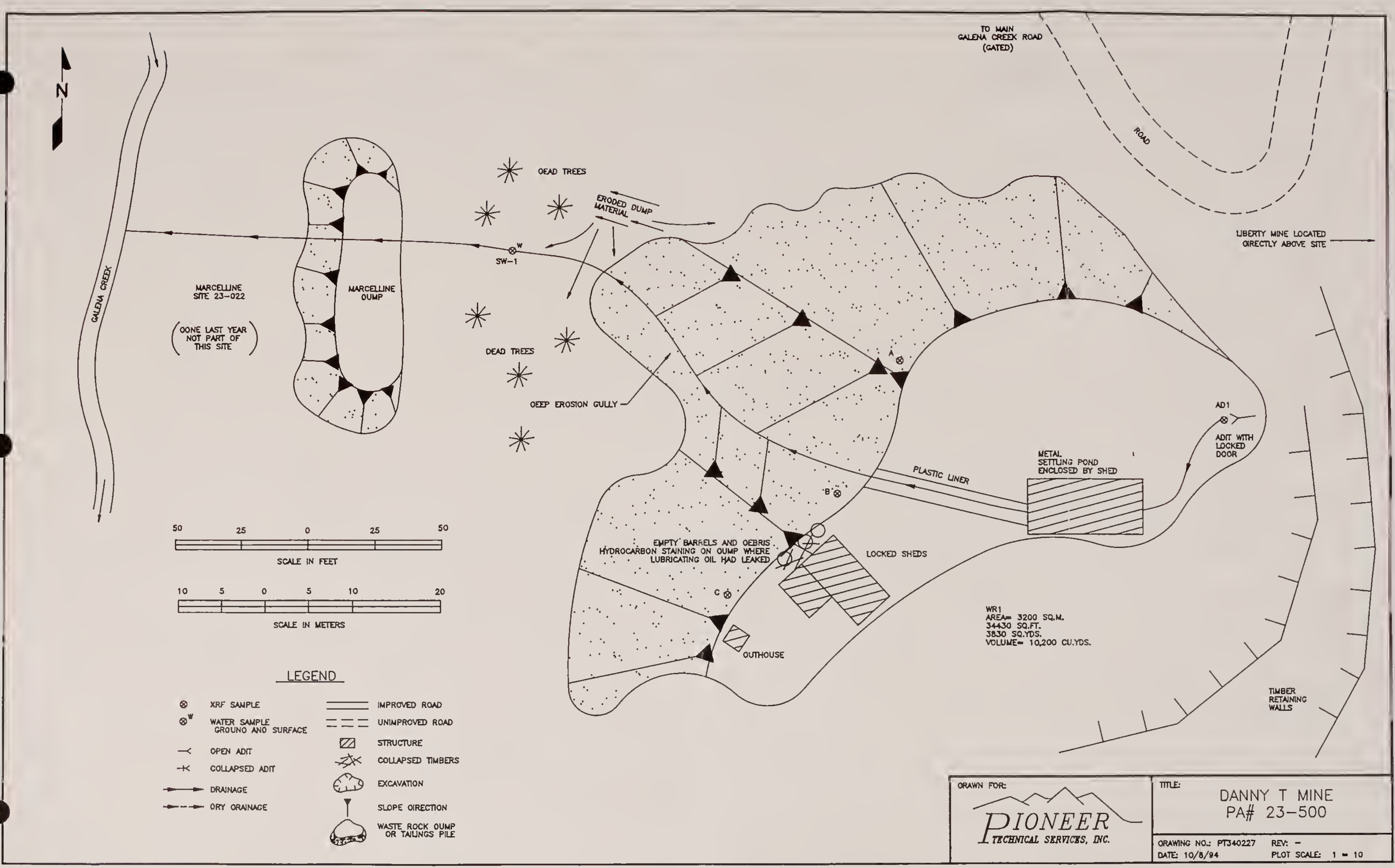
Origin of Ore Milled - Custom Mill___ **Dedicated Mill**___; **Number and names of mines that supplied mill feed:** N/A

Process? Hg-amalgam, CN^- leach (vat, heap), floatation, smelting?
N/A



PIONEER
TECHNICAL SERVICES, INC.

DANNY T, P.A. NO. 23-500
T15N, R09E, SECTION 07
SCALE: 1" = 1000'



DRAWN FOR:
PIONEER
TECHNICAL SERVICES, INC.

TITLE:
DANNY T MINE
PA# 23-500

DRAWING NO.: PT340227 REV: -
DATE: 10/8/94 PLOT SCALE: 1 = 10

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - *Use table on following page.*

Unique source identification: (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures/vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. **TAILINGS IMPOUNDMENTS** - *If tailings impoundments are also present, complete the following questions.*

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: West

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1A	WR	10,200	North end of dump, near top	None	< 3.5 (D)	0.07	23-500-WR-1	07/11/94 1400	T-Metals, ABA
WR-1B	WR		Center of dump, southwest facing slope, near top	None	< 3.5 (D)	0.05			
WR-1C	WR		South end of dump, near top	None	< 3.5 (D)	0.05			
SS-1	SOIL	N/A	Background soil	N/A	N/A	N/A	23-500-SS-1	07/11/94 1025	T-Metals

*D-Direct reading(Kelwey Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 23-500-WR-1 is composite of WR-1A through -1C.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes_X_, **No**___, **Number:**_1_ **Identification:**_AD-1_

Filled shafts: Yes___, **No**_X_, **Number:**___ **Identification:**___

Seeps/Springs: Yes___, **No**_X_, **Number:**___ **Identification:**___

Groundwater wells within 4 miles?: Yes___, **No**_X_;
Number of well logs:_0_

Distance to nearest well used for drinking:
___**<1,000 ft;**_X_**1,000 ft to 0.5 miles;**___**>0.5 miles.**

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite___, **Probable**_X_, **Possible**___, **Unlikely**___.
Precipitation and snowmelt can percolate through dump and cause migration of contaminants. Shallow groundwater, abundant metals and acid generating sulfides are all present.

Approximate Depth to Groundwater:_X_**<25 ft;**___ **25 - 100 ft;**___ **>100 ft.**

Other observations/notes: Discharge from AD-1 flows over WR-1 and into metal building which encloses settling tanks. The discharge exits the building and flows over a liner for approximately 40 feet. It then flows down a steep dump slope into drainage toward the Marcelline mine and Galena Creek. The adit discharge is causing deep erosion gullies on the steep side of the dump. Discharge eventually flows into Galena Creek after flowing over a Marcelline dump also. Adit opening has been closed with timbers and locked door; warning sign on locked door.

GROUNDWATER INVENTORY FORM

SAMPLERS: Bisch

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
AD-1	AD	Adit discharge associated with WR-1	8 gpm (E)	3.01	2020	499.1	9.6	0	N/A	23-500-AD-1	07/11/94 0850	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3

*FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ______

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X , No___, Name(s): Galena Creek

Dry streambeds: Yes____, No X , Name(s):

Other surface water: Yes X , No____, **Name(s)/Description:** Adit discharge to Galena Creek

Waste materials within any floodplain: Yes____, No X **Source ID(s):**

Approximate Flood frequency?___1 yr,___10 yr,___100 yr

Estimated seasonal flow of stream(s) (cfs/gpm)? N/A
High Flow:__________, **Average Flow:**__________

Distance between waste source(s) and nearest surface water body (ft)?
Base of WR-1 is 75 feet from Galena Creek.

Surface water draining onto or through waste sources: Yes X , No____,
Describe: Adit discharge flows over WR-1.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Irrigation, fishery, recreation, wetlands

Observed erosional/sedimentation/stream turbidity problems? Yes X , No_____. **Distance downstream (ft)?** 0-500 X ; 500-1,000___; >1,000___. **Describe/explain** (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Entire distance between WR-1 and Marcelline/Galena Creek is full of waste rock.

SURFACE WATER INVENTORY FORM

SAMPLERS: Bisch

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC $\mu S/cm$ @ 25°C	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	Adit discharge after flowing over WR-1; just above Marcelline dump	3.0	2120	9.4	0	8 gpm (E)	23-500-SW-1	07/11/94 0920	T-Metals, TDS, Hardness, Cl, SO4, NC2/NO3

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ______________________

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	*(SO_3)*
Presence of evaporative salt deposits?	*(ESD)*
Discolored or turbid seepage?	*(SPG)*
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	*(FEOX)*
Presence of burned or stressed vegetation?	*(VEG)*
pH ≤ 5.0	*(pH)*

General Potential for AMD Mitigation:

Area available for treatment (acres)? None

Wetlands present: Yes___, No X, Describe:

Carbonate rocks/soils: Yes X, No___, Describe: Limestone in the area

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30 X; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments

Nearest residence:___<1,000 ft; X 1,000 ft - 0.5 miles;___>0.5 miles.

For each source (table next page):

Available fine materials? *Surface area?*

Uncovered and unvegetated? *Wet or dry?*

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Bisch, West

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
WR-1	pH; FEOX; SO3; VEG	Dry	34,430	31,000	Yes	Moderate
AD-1	pH; FEOX precipitate	N/A	N/A	N/A	N/A	N/A

Notes and Clarifications: There are dead trees at the base of WR-1.

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes_____, No__X__,
Describe:____

Population within 1 mile: 1-10___; 10-30_X_; 30-100___; 100-300___; 300-1,000____; 1,000-3,000____; 3,000-10,000____; 10,000 or greater____;
Comments____

Evidence of recreational use on site: Yes___, No_X_, Describe:________
____

Accessibility (check each that apply): _X_Easily accessible - no fences, gates, or warning signs;___Moderately Accessible - barbed wire fences, road gated, or signs posted;____Difficult Access - chain-link fence, road gated and locked, site guarded (does not include locked or manned access points located more than 0.5 miles from the actual site).

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No_X_, Comment____________________

Wilderness Area - Yes___, No_X_, Comment____________________

T&E Species Habitat - Yes___, No_X_, Comment____________________

Bat Habitat - Yes___, No_X_, Comment____________________

Primary Drainage___; Secondary Drainage_X_; No Information___:

Riparian Habitat Quality - High___, Medium_X_, Low___

Wetlands Frontage - High___, Medium___, Low_X_

Fisheries Habitat and Species Classification - _6_

Sport Fishery Classification - _6_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes___, No_X_, Number_____, types and locations:____
____

Hazardous structures: Yes___, No_X_, Number_____, types and locations:_
____

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number_____, types and locations:____
____

Unstable waste piles, impoundments, undercut banks: Yes_X_, No_____, Number_1___, types and locations:___WR-1 is actively eroding down drainage.___

Fire and/or Explosion hazards: Yes___, No_X_, Explain:________________
____

Bibliography

MBMG, Well Log Database, July 14, 1994.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB, Environmental Assessment Analytical Data, Prepared by MSE, Inc., October 4, 1990.

MDSL/AMRB, Final Work Plan, Hugesville/Barker Mining District, Galena Creek Drainage, Basin Removal Site Investigation Preliminary Assessment, November 1990.

MDSL/AMRB, Hugesville/Barker Mining District, Galena Creek Drainage, Preliminary Assessment Project Report, Prepared by Chen-Northern, March 1991.

USGS, Topographic Map, Barker, Montana, 7 1/2 minute Quadrangle, 1961.

LABORATORY ANALYTICAL DATA

DANNY T
PA NO. 23-500

Danny T. Mine PA# 23-500
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 07/11/94

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
23-500-WR1	12.5 JX	200 J	125	0.5 U	1.8 U	1.6	56.3	28300	0.15 J	105	1.6 U	3140	5.9 UJ	213	NR
BACKGROUND	0.5 UX	4.5 UJ	150	0.4 U	6.1	8.9	11.2	15100	0.04 J	770	11.1	31.5	5.0 UJ	59.7	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
23-500-WR1	1.67	52.2	-7.53	-60	1.29	<0.01	0.38	0.00	-7.53

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
23-500-AD1	0.15	133	4.9	257 J	55.0	15.7	1010	142000	0.08 U	119000	40.8	144	96.1	58400	422
23-500-SW1	0.29	260	4.1	281 J	56.1	9.0	1130	142000	0.08 U	124000	40.7	113	107	62300	429

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
23-500-AD1	1790	<5	951	<0.05	NR
23-500-SW1	1850	<5	1050	<0.05	NR

LEGEND

WR1 - Composite of subsamples WR1A through 1C.
BACKGROUND - From the Danny T. Mine (23-500-SS1).
AD1 - Adit discharge associated with WR1.
SW1 - Adit discharge after flowing over WR1; just above Marcelline dump.

XRF ANALYSIS RESULTS

DANNY T
PA NO. 23-500

Mine Name: Danny T PA# 23-500
XRF Field Analyses
Results In PPM

XRF SAMPLE I.D.	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Ni	Cu	Zn	As	Sr
23-500-WR1A		23709	21084.7	1341.89			29136.7				296.433		314.016
23-500-WR1B		34860.9	3666.99	1776			50761.3	805.422 *		137.96	509.921		369.24
23-500-WR1C		29199.9	8175.76	2292.65			25864.1	491.726 *			95.6798 *		282.582
23-500-WR1-COMP		26172.9	13281.2	1654.98			24879.2				167.254 *		305.55

XRF SAMPLE I.D.	Zr	Hg	Mo	Pb	Rb	Cd	Sn	Sb	Ba	Ag	U	Th
23-500-WR1A	200.985			1349.47	194.17				895.486			30.2923 *
23-500-WR1B	258.509			11449.6	243.678	277.435 *			576.357		25.8169	47.0604 *
23-500-WR1C	183.087			2133.15	236.997				964.278			30.935 *
23-500-WR1-COMP	213.19			1444.27	206.628				941.032		33.6506 *	27.6949 *

* = Estimated Quantity

$ = Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

DANNY T
PA NO. 23-500

AIMSS SCORESHEET

SITE NAME: Danny T.
PA NUMBER: 23-500

LINE NO.				
		GROUNDWATER PATHWAY		
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	40.150
6	GW - TARGETS	WELLS - 1 MI. x 2.5		0.0
7		WELLS - 1 TO 4 MI		0
8		NEAREST WELL		5
9		TARGETS SCORE	LINES 6 + 7 + 8	5.0
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	80300
		SURFACE WATER PATHWAY		
11		OBSERVED RELEASE		0
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		10
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	200
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	200
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	46.186
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		1
18		WETLANDS		10
19		FISHERY		0
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	18
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	166270
		AIR PATHWAY		
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		10
26B		DISTANCE TO POPULATION		10
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	100
27		LIKELIHOOD SCORE	LINES 25 + 26C	100
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.364
29	AIR - TARGETS	POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		5
31		WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	15
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	546
		DIRECT CONTACT PATHWAY		
36		OBSERVED EXPOSURE		0
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		10
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	200
38		LIKELIHOOD SCORE	LINES 36 + 37C	200
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.331
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		10
41		NEAREST RESIDENCE		5
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 THRU 42	15
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	993
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE (LINES 10 + 24 + 35 + 44) / 100,000			2.48

SITE NAME: Danny T.
PA NUMBER: 23-500

SITE SAFETY

LINE NO.				
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		100
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	100
9		POPULATION - 1 MILE		10
10	TARGETS	NEAREST RESIDENCE		5
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 THRU 11	15
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	30.00

SUMMARY OF HISTORICAL ANALYTICAL DATA FROM OTHER SOURCES

REPORT DATE: October 4, 1990

CLIENT: Abandon Mines

FIELD ID: Jimmy T Dump Discharge

LAB NO: W8573

DATE RECEIVED: 09-14-90

Hardness 611 mg/L as $CaCO_3$

Total Extractable Metals

As 0.462 mg/L

Cd 0.262 mg/L

Cu 1.44 mg/L

Fe 307 mg/L

Pb 0.099 mg/L

Zn 78.8 mg/L

HUGHESVILLE SURFACE WATER QUALITY DATA
Physical Properties

Station	Sample Type	Sample Date	Sample Time	Lab Number	Sampling Method	Water Temperature (C)	Field pH (s.u.)	Lab pH (s.u.)	Field SC (umhos/cm)	Lab SC (umhos/cm)	Flow (cfs)	TDS (mg/l)		Sodium Adsorption Ratio
DF-01	BFS	10/17/90	1520	108721	EDI					2100		1600		6.11
DF-01	D	10/17/90	1230	108730	EDI	0.5	5.9	5.7	440	445	0.680	398	R	0.33
DF-01	LD	10/30/90		108730				5.5				420	R	
DF-01	N	10/17/90	1220	108731	EDI	0.5	5.9	5.7	440	440	0.680	350	R	0.31
DF-01	XCB	10/17/90	1410	108719	EDI	16.0	5.2	5.6	2	2	0.680	10	U	0.67
DF-02	N	10/16/90	1615	108727	EDI	3.0	5.7	6.6	292	205	0.030	162	R	0.38
DF-03	N	10/17/90	1000	108729	GRAB	3.0	2.9	3.1	2176	1770	0.004	1790	R	0.43
DF-04	BFS	10/18/90	1540	108720	EDI			9.2		2100		1610		6.12
DF-04	D	10/18/90	1340	108736	EDI	4.0	6.2	6.1	432	420	0.390	365		0.34
DF-04	N	10/16/90	1330	108735	EDI	4.0	6.1	6.1	440	410	0.390	353		0.34
DF-04	XCB	10/18/90	1450	108716	EDI	16.0	5.2	6.7	2	2	0.390	10	U	0.67
DF-05	N	10/16/90	1045	108722	EDI	3.0	6.4	6.6	345	360	0.400	292		0.34
DF-07	N	10/16/90	1200	108726	EDI	3.0	7.1	7.9	291	280	0.310	222		0.10
DF-08	N	10/15/90	1710	108733	GRAB	4.0	7.1	7.3	288	310	0.090	235		0.12
DF-14	LD	10/30/90		108725				8.2		300				
DF-14	N	10/15/90	1600	108725	GRAB	5.0	7.7	8.0	288	300	0.320	208		0.09
DF-21	N	10/17/90	1440	108717	EDI	4.0	6.9	6.9	363	370	1.340	300	R	0.36
DF-22	N	10/17/90	1330	108718	EDI	4.0	7.9	8.0	195	190	4.210	113	R	0.08
DF-40	N	10/17/90	1535	108715	EDI	3.5	7.9	7.8	256	245	7.920	160	R	0.07
DF-45	N	10/15/90	1830	108734	GRAB	4.0	7.1	7.3	551	480	0.002	407		0.42
DF-46	N	10/16/90	1710	108728	EDI	3.0	7.4	5.7	493	450	0.510	396	R	0.32
DF-47	N	10/17/90	1125	108723	EDI	0.0	5.5	5.2	466	470	0.737	432		0.39
DF-49	N	10/15/90	1500	108732	GRAB	4.0	5.6	7.2	305	330	0.130	246	R	0.12

2,3,4,+46

NOTES:
1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.
2) Data-quality analysis codes are defined as: A - blind field standard outside of advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not useable for statistics.
3) Blanks indicate values not determined.
4) Sampling methods are defined as: EDI - equal-discharge interval, GRAB - grab sample.

Surfacewater Quality Database

HUGHESVILLE SURFACE WATER DATA
Metals Data

Station	Sample Type	Sample Date	Sample Time	Aluminum Total (mg/l)		Aluminum Dissolved (mg/l)		Arsenic Total (mg/l)		Arsenic Dissolved (mg/l)		Barium Total (mg/l)		Barium Dissolved (mg/l)		Cadmium Total (mg/l)		Cadmium Dissolved (mg/l)	
DF-01	BFS	10/17/90	1520	0.3		0.3		0.120		0.100		0.1		0.2		0.1040		0.0980	
DF-01	D	10/17/90	1230	7.0	A	0.3	AR	0.028		0.002	U	0.1	UA	0.1	UA	0.0500		0.0440	
DF-01	LD	10/30/90		6.9	A	0.3	AR	0.030		0.002	U	0.1	UA	0.1	UA	0.0520		0.0440	
DF-01	N	10/17/90	1220	7.5	A	0.6	AR	0.027		0.002	U	0.1	UA	0.1	UA	0.0530		0.0440	
DF-01	XCB	10/17/90	1410	0.1	U	0.1	U	0.002	U	0.002	U	0.1	U	0.1	U	0.0001	U	0.0001	U
DF-02	N	10/16/90	1615	1.4	A	0.6	AR	0.002	U	0.002	U	0.1	UA	0.1	UA	0.0141		0.0140	
DF-03	N	10/17/90	1000	10.5	A	9.9	AR	0.026		0.022		0.1	UA	0.1	UA	0.2600		0.2600	
DF-04	BFS	10/18/90	1540	0.3		0.3		0.110		0.110		0.1		0.1		0.0980		0.0980	
DF-04	D	10/18/90	1340	4.0	AR	0.2	A	0.015		0.002	U	0.1	UA	0.1	UA	0.0320		0.0270	
DF-04	N	10/16/90	1330	3.3	AR	0.2	A	0.017		0.002	U	0.1	UA	0.1	UA	0.0350		0.0320	
DF-04	XCB	10/18/90	1450	0.1	U	0.1	U	0.002	U	0.002	U	0.1	U	0.1	U	0.0001	U	0.0001	U
DF-05	N	10/16/90	1045	1.1	AR	0.1	UA	0.006		0.002	U	0.1	UA	0.1	UA	0.0114		0.0082	
DF-07	N	10/16/90	1200	0.1	AR	0.1	UA	0.002	U	0.002	U	0.1	UA	0.1	UA	0.0008		0.0008	
DF-08	N	10/15/90	1710	0.1	AR	0.1	UA	0.002	U	0.002	U	0.1	UA	0.1	UA	0.0024		0.0019	
DF-14	LD	10/30/90		0.1	UAR	0.1	UA					0.1	UA	0.1	UA	0.0002			
DF-14	N	10/15/90	1600	0.1	AR	0.1	UA	0.008		0.002	U	0.1	UA	0.1	UA	0.0005		0.0001	U
DF-21	N	10/17/90	1440	3.3	A	0.1	AR	0.022		0.002	U	0.1	UA	0.1	UA	0.0300		0.0200	
DF-22	N	10/17/90	1330	0.1	UA	0.1	UAR	0.002	U	0.002	U	0.1	UA	0.1	UA	0.0001	U	0.0001	U
DF-40	N	10/17/90	1535	0.7	A	0.1	UAR	0.005		0.002	U	0.1	UA	0.1	UA	0.0068		0.0038	
DF-45	N	10/15/90	1830	0.3	AR	0.1	UA	0.106		0.008		0.1	UA	0.1	UA	0.0125		0.0072	
DF-46	N	10/16/90	1710	4.2	A	0.7	AR	0.002	U	0.002	U	0.1	UA	0.1	UA	0.0450		0.0440	
DF-47	N	10/17/90	1125	4.4	AR	1.8	A	0.027		0.002	U	0.1	UA	0.1	UA	0.0500		0.0480	
DF-49	N	10/15/90	1500	0.1	UA	0.1	UAR	0.021		0.005		0.1	UA	0.1	UA	0.0002		0.0001	U

NOTES:
1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.
2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not useable for statistics.
3) Blanks indicate values not determined.

HUGHESVILLE SURFACE WATER DATA
Metals Data

Station	Sample Type	Sample Date	Sample Time	Chromium Total (mg/l)	Chromium Dissolved (mg/l)	Copper Total (mg/l)	Copper Dissolved (mg/l)	Iron Total (mg/l)	Iron Dissolved (mg/l)	Lead Total (mg/l)	Lead Dissolved (mg/l)
DF-01	BFS	10/17/90	1520	0.195	0.165	0.26	0.26	0.14	0.14	0.150	0.150
DF-01	D	10/17/90	1230	0.004 AC	0.001 UA	0.21	0.06	26.20	3.85	0.210 A	0.001 UA
DF-01	LD	10/30/90		0.003 AC	0.001 A	0.20	0.06	26.50	4.20	0.215 A	0.001 UA
DF-01	N	10/17/90	1220	0.003 AC	0.001 UA	0.20	0.07	26.70	3.91	0.200 A	0.010 A
DF-01	XCB	10/17/90	1410	0.001 C	0.001 U	0.02 U	0.02 U	0.05 U	0.05 U	0.001 U	0.001 U
DF-02	N	10/16/90	1615	0.002 AC	0.001 UA	0.05	0.04	1.15	0.06	0.053 A	0.034 A
DF-03	N	10/17/90	1000	0.010 AC	0.001 UA	0.70	0.70	130.00	128.00	0.110 A	0.102 A
DF-04	BFS	10/18/90	1540	0.195	0.165	0.26	0.26	0.14	0.14	0.150	0.150
DF-04	D	10/18/90	1340	0.002 A	0.001 UA	0.11	0.02	17.90	11.20	0.037 A	0.001 UA
DF-04	N	10/16/90	1330	0.002 A	0.001 UA	0.11	0.03	18.30	11.90	0.038 A	0.001 UA
DF-04	XCB	10/18/90	1450	0.001 U	0.001 U	0.02 U	0.02 U	0.05 U	0.05 U	0.001 U	0.001 U
DF-05	N	10/16/90	1045	0.002 A	0.001 A	0.04	0.02 U	8.61	0.98	0.029 A	0.001 UA
DF-07	N	10/16/90	1200	0.001 UA	0.001 UA	0.02 U	0.02 U	0.32	0.06	0.003 A	0.001 UA
DF-08	N	10/15/90	1710	0.001 UA	0.001 UA	0.02	0.02 U	0.17	0.05 U	0.008 A	0.001 UA
DF-14	LD	10/30/90		A	A	0.02 U	0.02 U	0.69	0.05 U	A	A
DF-14	N	10/15/90	1600	0.002 A	0.001 UA	0.02 U	0.02 U	0.78	0.05 U	0.002 A	0.001 UA
DF-21	N	10/17/90	1440	0.003 AC	0.001 UA	0.16	0.02 U	16.60	0.06	0.155 A	0.001 UA
DF-22	N	10/17/90	1330	0.001 AC	0.001 UA	0.02 U	0.02 U	0.08	0.05 U	0.001 UA	0.001 UA
DF-40	N	10/17/90	1535	0.004 AC	0.001 UA	0.04	0.02 U	2.92	0.05 U	0.014 A	0.001 UA
DF-45	N	10/15/90	1830	0.001 A	0.001 UA	0.02 U	0.02 U	8.97	0.07	0.017 A	0.001 UA
DF-46	N	10/16/90	1710	0.003 AC	0.001 UA	0.19	0.06	21.80	13.60	0.046 A	0.002 A
DF-47	N	10/17/90	1125	0.004 A	0.001 UA	0.19	0.16	24.10	7.08	0.195 A	0.043 A
DF-49	N	10/15/90	1500	0.003 AC	0.001 UA	0.02 U	0.02 U	1.79	0.05 U	0.001 UA	0.001 UA

NOTES: 1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.

2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not useable for statistics.

3) Blanks indicate values not determined.

HUGHESVILLE SURFACE WATER DATA
Metals Data

Station	Sample Type	Sample Date	Sample Time	Manganese Total (mg/l)	Manganese Dissolved (mg/l)	Mercury Total (mg/l)	Mercury Dissolved (mg/l)	Nickel Total (mg/l)	Nickel Dissolved (mg/l)	Selenium Total (mg/l)	Selenium Dissolved (mg/l)
DF-01	BFS	10/17/90	1520	0.170	0.170	0.0046	0.0046	0.380	0.380	0.087	0.087
DF-01	D	10/17/90	1230	12.100 R	12.100 CR	0.0002 U	0.0002 U	0.017	0.010	0.005 U	0.005 U
DF-01	LD	10/30/90		12.000 R	12.100 CR	0.0002 U	0.0002 U	0.016	0.008	0.005 U	0.005 U
DF-01	N	10/17/90	1220	12.400 R	12.400 CR	0.0002 U	0.0002 U	0.012	0.011	0.005 U	0.005 U
DF-01	XCB	10/17/90	1410	0.015 U	0.015 C	0.0002 U	0.0002 U	0.002 U	0.002 U	0.005 U	0.005 U
DF-02	N	10/16/90	1615	2.040 R	2.040 CR	0.0002 U	0.0002 U	0.020	0.002 U	0.005 U	0.005 U
DF-03	N	10/17/90	1000	129.000 R	128.000 CR	0.0002 U	0.0002 U	0.150	0.130	0.005 U	0.005 U
DF-04	BFS	10/18/90	1540	0.160	0.160	0.0047	0.0047	0.350	0.350	0.093	0.090
DF-04	D	10/18/90	1340	8.400 R	8.400 R	0.0002 U	0.0002 U	0.017	0.006	0.005 U	0.005 U
DF-04	N	10/16/90	1330	7.560 R	7.560 R	0.0002 U	0.0002 U	0.013	0.008	0.005 U	0.005 U
DF-04	XCB	10/18/90	1450	0.015 U	0.015 U	0.0002 U	0.0002 U	0.002 U	0.002 U	0.005 U	0.005 U
DF-05	N	10/16/90	1045	5.280 R	5.280 R	0.0002 U	0.0002 U	0.006	0.002	0.005 U	0.005 U
DF-07	N	10/16/90	1200	0.230 R	0.230 R	0.0002 U	0.0002 U	0.002 U	0.002 U	0.005 U	0.005 U
DF-08	N	10/15/90	1710	0.410 R	0.410 R	0.0002 U	0.0002 U	0.003	0.002 U	0.005 U	0.005 U
DF-14	LD	10/30/90		0.190 R	0.180 R			0.007		0.005 U	0.005 U
DF-14	N	10/15/90	1600	0.212 R	0.173 R	0.0002 U	0.0002 U	0.004	0.002 U	0.005 U	0.005 U
DF-21	N	10/17/90	1440	7.150 R	7.150 CR	0.0002 U	0.0002 U	0.010	0.006	0.005 U	0.005 U
DF-22	N	10/17/90	1330	0.064 R	0.064 CR	0.0002 U	0.0002 U	0.002 U	0.002 U	0.005 U	0.005 U
DF-40	N	10/17/90	1535	1.990 R	1.990 CR	0.0002 U	0.0002 U	0.007	0.002 U	0.005 U	0.005 U
DF-45	N	10/15/90	1830	7.290 R	7.290 R	0.0002 U	0.0002 U	0.006	0.002	0.005 U	0.005 U
DF-46	N	10/16/90	1710	13.100 R	13.100 CR	0.0002 U	0.0002 U	0.017	0.010	0.005 U	0.005 U
DF-47	N	10/17/90	1125	13.400 R	10.600 R	0.0002 U	0.0002 U	0.016	0.006	0.005 U	0.005 U
DF-49	N	10/15/90	1500	0.314 R	0.311 CR	0.0002 U	0.0002 U	0.017	0.003	0.005 U	0.005 U

NOTES: 1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.

2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not useable for statistics.

3) Blanks indicate values not determined.

HUGHESVILLE SURFACE WATER DATA
Metals Data

Station	Sample Type	Sample Date	Sample Time	Silver Total (mg/l)		Silver Dissolved (mg/l)		Zinc Total (mg/l)		Zinc Dissolved (mg/l)	
DF-01	BFS	10/17/90	1520	0.0430		0.0390		0.20		0.20	
DF-01	D	10/17/90	1230	0.0009	A	0.0001	UA	11.30		11.30	
DF-01	LD	10/30/90		0.0009	A	0.0001	UA	11.20		11.60	
DF-01	N	10/17/90	1220	0.0009	A	0.0001	UA	11.90		11.80	
DF-01	XCB	10/17/90	1410	0.0001	U	0.0001	U	0.02	U	0.02	U
DF-02	N	10/16/90	1615	0.0001	UA	0.0001	UA	2.55		2.55	
DF-03	N	10/17/90	1000	0.0003	A	0.0001	UA	65.00		65.00	
DF-04	BFS	10/18/90	1540	0.0390		0.0350		0.19		0.19	
DF-04	D	10/18/90	1340	0.0005	A	0.0001	UA	7.52		7.48	R
DF-04	N	10/16/90	1330	0.0070	A	0.0001	UA	7.44		7.35	R
DF-04	XCB	10/18/90	1450	0.0001	U	0.0001	U	0.02	U	0.02	U
DF-05	N	10/16/90	1045	0.0002	A	0.0001	UA	2.95		2.71	R
DF-07	N	10/16/90	1200	0.0001	UA	0.0001	UA	0.24		0.23	R
DF-08	N	10/15/90	1710	0.0001	UA	0.0001	UA	0.50		0.51	R
DF-14	LD	10/30/90			A		A	0.08		0.05	R
DF-14	N	10/15/90	1600	0.0004	A	0.0001	UA	0.09		0.04	R
DF-21	N	10/17/90	1440	0.0006	A	0.0001	UA	6.30		4.65	
DF-22	N	10/17/90	1330	0.0001	UA	0.0001	UA	0.05		0.02	U
DF-40	N	10/17/90	1535	0.0018	A	0.0001	UA	1.08		0.62	
DF-45	N	10/15/90	1830	0.0001	UA	0.0001	UA	2.03		1.45	R
DF-46	N	10/16/90	1710	0.0004	A	0.0001	UA	11.00		11.00	
DF-47	N	10/17/90	1125	0.0008	A	0.0001	UA	11.90		11.90	R
DF-49	N	10/15/90	1500	0.0001	UA	0.0001	UA	0.09		0.07	

NOTES: 1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.

2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not useable for statistics.

3) Blanks indicate values not determined.

HUGHESVILLE SURFACE WATER DATA

Anions Data

Station	Sample Type	Sample Date	Sample Time	Total Alkalinity as CaCo3 (mg/l)		Bicarbonate Alkalinity as HCO3 (mg/l)		Carbonate Alkalinity as CO3 (mg/l)	Hydroxide Alkalinity as OH (mg/l)	Chloride as Cl (mg/l)		Fluoride as F (mg/l)		Nitrate + Nitrite as N (mg/l)		Sulfate as SO4 (mg/l)
DF-01	BFS	10/17/90	1520	203		248		0	0	328		15.80		4.80		340
DF-01	D	10/17/90	1230	4	C	5		0	0	1	U	0.55		0.05	U	252
DF-01	LD	10/30/90		4	C					1	U			0.05	U	
DF-01	N	10/17/90	1220	5	C	6		0	0	1	U	0.59		0.05	U	253
DF-01	XCB	10/17/90	1410	5	C	6		0	0	1	U	0.05	U	0.05	U	1
DF-02	N	10/16/90	1615	14	C	17		0	0	1	U	0.28		0.05	U	97
DF-03	N	10/17/90	1000	1	UC	1	U	0	0	1	U	1.57		0.20		1260
DF-04	BFS	10/18/90	1540	211		258		0	0	334		14.10		4.84		337
DF-04	D	10/18/90	1340	14	C	17		0	0	1	U	0.45		0.05	U	230
DF-04	N	10/16/90	1330	16	C	20		0	0	1	U	0.45		0.05	U	226
DF-04	XCB	10/18/90	1450	10	C	12		0	0	1	U	0.05	U	0.05	U	2
DF-05	N	10/16/90	1045	56	C	68		0	0	1	U	0.36		0.05	U	152
DF-07	N	10/16/90	1200	83	C	101		0	0	1	U	0.19		0.05	U	90
DF-08	N	10/15/90	1710	38	C	46		0	0	1	U	0.18		0.05	U	137
DF-14	LD	10/30/90			C							0.21		0.05	U	
DF-14	N	10/15/90	1600	122	C	149		0	0	1	U	0.21		0.05	U	57
DF-21	N	10/17/90	1440	45	C	55		0	0	1	U	0.33		0.05	U	166
DF-22	N	10/17/90	1330	107	C	131		0	0	1	U	0.07		0.05	U	7
DF-40	N	10/17/90	1535	91	C	111		0	0	1	U	0.10		0.05	U	50
DF-45	N	10/15/90	1830	71	C	87		0	0	1	U	2.15		0.09		220
DF-46	N	10/16/90	1710	6	C	7		0	0	1	U	0.53		0.05	U	266
DF-47	N	10/17/90	1125	2	C	2		0	0	1	U	0.59		0.05	U	276
DF-49	N	10/15/90	1500	141	C	172		0	0	1	U	0.30		0.05	U	60

NOTES: 1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.

2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplictes outside expected range, U - less than detection limit, Z - value not useable for statistics.

3) Blanks indicate values not determined.

HUGHESVILLE SURFACE WATER DATA
Cations Data

Station	Sample Type	Sample Date	Sample Time	Total Hardness as CaCo3 (mg/l)		Calcium as Ca (mg/l)		Magnesium as Mg (mg/l)		Potassium as K (mg/l)		Sodium as Na (mg/l)	
DF-01	BFS	10/17/90	1520	565		139		53		268		334	
DF-01	D	10/17/90	1230	253	A	70		19		1	UA	12	C
DF-01	LD	10/30/90			A	65		18		1	UA	16	C
DF-01	N	10/17/90	1220	243	A	66		19		1	UA	11	C
DF-01	XCB	10/17/90	1410	7	U	1	U	1	U	1	U	4	C
DF-02	N	10/16/90	1615	104	A	35		4		1	UA	9	C
DF-03	N	10/17/90	1000	631	A	172		49		1	UA	25	C
DF-04	BFS	10/18/90	1540	560		137		53		268		333	
DF-04	D	10/18/90	1340	238	A	64		19		1	UA	12	C
DF-04	N	10/16/90	1330	240	A	65		19		1	UA	12	C
DF-04	XCB	10/18/90	1450	7	U	1	U	1	U	1	U	4	C
DF-05	N	10/16/90	1045	198	A	53		16		1	UA	11	C
DF-07	N	10/16/90	1200	182	A	48		15		1	UA	3	C
DF-08	N	10/15/90	1710	187	A	52		14		1	UA	4	C
DF-14	LD	10/30/90			A	48		18			A	4	C
DF-14	N	10/15/90	1600	192	A	47		18		1	UA	3	C
DF-21	N	10/17/90	1440	204	A	57		15		1	UA	12	C
DF-22	N	10/17/90	1330	121	A	35		8		1	UA	2	C
DF-40	N	10/17/90	1535	149	A	43		10		1	UA	2	C
DF-45	N	10/15/90	1830	282	A	85		17		1	UA	16	C
DF-46	N	10/16/90	1710	261	A	70		21		1	UA	12	C
DF-47	N	10/17/90	1125	247	A	66		20		1	UA	14	C
DF-49	N	10/15/90	1500	216	A	45		25		1	UA	4	C

NOTES:
1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicte, N - natural, XCB - cross-contamination blank.
2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not useable for statistics.
3) Blanks indicate values not determined.

APPENDIX B-2

GROUNDWATER QUALITY DATA BASE

HUGHESVILLE GROUNDWATER QUALITY DATA

Physical Properties

Station	Sample Type	Sample Date	Sample Time	Lab Number	Sampling Method	Water Temperature (C)	Field pH (s.u.)	Lab pH (s.u.)	Field SC (umhos/cm)	Lab SC (umhos/cm)	TDS (mg/l)		Sodium Adsorption Ratio
AMAX-2	LD	11/30/90		109249				2.9		6130	8560		
AMAX-2	N	11/14/90	1650	109249	HLP	6.0	2.5	2.9	6280	6010	8460		0.28
HMW-01	N	11/15/90	0900	109248	HLP	5.0	5.5	5.5	2385	2340	2410		0.13
HMW-02	N	11/14/90	1615	109237	HLP	6.0	2.8	3.2	5480	5600	7930	R	0.32
HMW-03	N	11/15/90	0950	109247	BAIL	4.0	7.5	8.0	1330	1250	822		6.09
HMW-04	N	11/15/90	1100	109246	HLP	6.0	6.4	6.7	232	243	152		0.13
HMW-05	N	11/14/90	0940	109242	BAIL	7.0	5.7	5.9	2004	2110	1860	R	0.41
HMW-06	N	11/14/90	1300	109238	HLP	6.5	4.8	4.6	1782	2050	1540	R	0.34
HMW-08	BFS	11/14/90	1115	109256	HLP			0.0		845			5.41
HMW-08	D	11/14/90	1055	109240	HLP	7.0	5.1	5.1	918	1030	860	R	0.17
HMW-08	LD	11/29/90		109240				5.1		1030	860	R	
HMW-08	N	11/14/90	1045	109241	HLP	7.0	5.1	5.1	918	1110	780	R	0.20
HMW-08	XCB	11/14/90	1105	109239	HLP	8.0	4.9	5.0	9	33	1	U	0.16
MCBRIDE	BFS	11/15/90	1330	109250	PUMP			9.0		880			5.44
MCBRIDE	D	11/15/90	1300	109244	PUMP	6.0	6.7	7.3	360	355	216		0.06
MCBRIDE	N	11/15/90	1245	109245	PUMP	5.5	6.6	7.1	348	359	216		0.06
MCBRIDE	XCB	11/15/90	1315	109243	PUMP	6.0	3.6	5.5	6	10	8	U	0.16

NOTES:
1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.
2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection, Z - value not usable for statistics.
3) Blanks indicate values not determined.
4) Sampling methods are defined as: BAIL - bailed, HLP - hand-lift pump, PUMP - mechanically pumped.

HUGHESVILLE GROUNDWATER DATA
Dissolved Metals

Station	Sample Type	Sample Date	Sample Time	Aluminum (mg/l)	Arsenic (mg/l)	Barium (mg/l)	Cadmium (mg/l)	Chromium (mg/l)	Copper (mg/l)	Iron (mg/l)	Lead (mg/l)
AMAX-2	LD	11/30/90		127.0	0.002	0.2	0.8270 C	0.240	13.00	1570.00 AR	0.002
AMAX-2	N	11/14/90	1650	128.0	0.002	0.2	0.8300 C	0.230	13.00	1550.00 AR	0.002
HMW-01	N	11/15/90	0900	0.9	0.002 U	0.1 U	0.2270 C	0.002 U	0.08	166.00 AR	0.001 U
HMW-02	N	11/14/90	1615	87.0	0.002 U	0.3	1.0900 C	0.024 C	17.00	1260.00 ACR	0.030
HMW-03	N	11/15/90	0950	0.1 U	0.002	0.1 U	0.0002 C	0.014	0.02 U	0.08 AR	0.001 U
HMW-04	N	11/15/90	1100	0.1 U	0.002 U	0.1 U	0.0013 C	0.014	0.02 U	0.05 UAR	0.001 U
HMW-05	N	11/14/90	0940	0.9	0.069	0.1 U	0.1190 C	0.002 UC	0.02 U	135.00 ACR	0.002
HMW-06	N	11/14/90	1300	14.0	0.003	0.1 U	0.4400 C	0.007 C	1.64	143.00 ACR	0.066
HMW-08	BFS	11/14/90	1115	0.2	0.088	0.2	0.1000	0.130	0.28	0.17	0.088
HMW-08	D	11/14/90	1055	1.3	0.036	0.1 U	0.0950 C	0.002 UC	0.02 U	78.00 ACR	0.800
HMW-08	LD	11/29/90		1.4	0.036	0.1 U	0.0920 C	0.002 UC	0.02 U	71.00 ACR	0.800
HMW-08	N	11/14/90	1045	1.4	0.034	0.1 U	0.0960 C	0.002 UC	0.02 U	70.00 ACR	0.860
HMW-08	XCB	11/14/90	1105	0.1 U	0.002 U	0.1 U	0.0038 C	0.002 C	0.02 U	0.09 C	0.001 U
MCBRIDE	BFS	11/15/90	1330	0.2	0.088	0.2	0.1020	0.140	0.26	0.18	0.082
MCBRIDE	D	11/15/90	1300	0.1 U	0.002 U	0.1 U	0.0002 C	0.002 U	0.02 U	1.36 AR	0.001 U
MCBRIDE	N	11/15/90	1245	0.1 U	0.002 U	0.1 U	0.0002 C	0.002 U	0.02 U	1.74 AR	0.001 U
MCBRIDE	XCB	11/15/90	1315	0.1 U	0.002 U	0.1 U	0.0003 C	0.002 U	0.02 U	0.05 U	0.001 U

NOTES: 1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.

2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not usable for statistics.

3) Blanks indicate values not determined.

HUGHESVILLE GROUNDWATER DATA
Dissolved Metals

Station	Sample Type	Sample Date	Sample Time	Manganese (mg/l)		Mercury (mg/l)		Nickel (mg/l)		Selenium (mg/l)		Silver (mg/l)		Zinc (mg/l)	
AMAX-2	LD	11/30/90		490.00	A		A	0.61				0.0003	AC	113.00	
AMAX-2	N	11/14/90	1650	480.00	A	0.0002	UA	0.62		0.005	U	0.0002	AC	113.00	
HMW-01	N	11/15/90	0900	164.00	A	0.0002	UA	0.31		0.005	U	0.0003	AC	41.00	
HMW-02	N	11/14/90	1615	320.00	CR	0.0002	U	0.62	A	0.005	U	0.0015	AC	110.00	
HMW-03	N	11/15/90	0950	0.100	A	0.0002	UA	0.02	U	0.005	U	0.0001	UAC	0.02	U
HMW-04	N	11/15/90	1100	0.180	A	0.0002	UA	0.02	U	0.005	U	0.0002	AC	0.25	
HMW-05	N	11/14/90	0940	86.000	CR	0.0002		0.19	A	0.005	U	0.0010	AC	58.00	
HMW-06	N	11/14/90	1300	89.000	CR	0.0002	U	0.18	A	0.005	U	0.0005	AC	73.00	
HMW-08	BFS	11/14/90	1115	0.170		0.0049		0.30		0.080		0.0400		0.20	
HMW-08	D	11/14/90	1055	50.000	CR	0.0002	U	0.09	A	0.005	U	0.0005	AC	24.00	
HMW-08	LD	11/29/90		46.000	CR	0.0002	U	0.08	A	0.005	U	0.0004	AC	23.00	
HMW-08	N	11/14/90	1045	45.000	CR	0.0002	U	0.12	A	0.005	U	0.0008	AC	23.00	
HMW-08	XCB	11/14/90	1105	0.030	C	0.0002	U	0.02	U	0.005	U	0.0006	C	0.02	U
MCBRIDE	BFS	11/15/90	1330	0.085		0.0070		0.39		0.088		0.0400		0.20	
MCBRIDE	D	11/15/90	1300	0.180	A	0.0002	UA	0.03		0.005	U	0.0012	AC	0.04	
MCBRIDE	N	11/15/90	1245	0.200	A	0.0002	UA	0.04		0.005	U	0.0007	AC	0.04	
MCBRIDE	XCB	11/15/90	1315	0.020	U	0.0002	U	0.02	U	0.005	U	0.0070	C	0.02	U

NOTES:
1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.
2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit,
N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not useable for statistics.
3) Blanks indicate values not determined.

HUGHESVILLE GROUNDWATER DATA
Anions Data

Station	Sample Type	Sample Date	Sample Time	Total Alkalinity as CaCo3 (mg/l)		Bicarbonate Alkalinity HCO3 (mg/l)		Carbonate Alkalinity CO3 (mg/l)	Hydroxide Alkalinity as OH (mg/l)	Chloride as Cl (mg/l)		Fluoride as F (mg/l)		Nitrate & Nitrite as N (mg/l)		Sulfate as SO4 (mg/l)	
AMAX-2	LD	11/30/90		1	UC					2		0.16		0.03	UCR	5860	
AMAX-2	N	11/14/90	1650	1	UC	1	U	0	0	2		0.14		0.03	UCR	5900	
HMW-01	N	11/15/90	0900	1	UC	1	U	0	0	1	U	0.62		0.03	UCR	1690	
HMW-02	N	11/14/90	1615	1	UC	1	U	0	0	1	U	0.18		0.03	UCR	4980	C
HMW-03	N	11/15/90	0950	404	C	493		0	0	6		0.41		0.30	CR	227	
HMW-04	N	11/15/90	1100	35	C	43		0	0	1	U	0.16		0.14	CR	72	
HMW-05	N	11/14/90	0940	12	C	15		0	0	4		2.07		0.03	UCR	1390	C
HMW-06	N	11/14/90	1300	1	UC	1	U	0	0	2		0.62		0.04	CR	1210	C
HMW-08	BFS	11/14/90	1115	188		229		0	0	320		16.50		3.85		290	
HMW-08	D	11/14/90	1055	1	UC	1	U	0	0	1	U	0.94		0.31	CR	548	C
HMW-08	LD	11/29/90		1	UC					1	U	0.89		0.30	CR	526	C
HMW-08	N	11/14/90	1045	1	UC	1	U	0	0	1	U	0.94		0.05	CR	489	C
HMW-08	XCB	11/14/90	1105	2	C	2		0	0	1	U	0.10	U	0.15	C	3	C
MCBRIDE	BFS	11/15/90	1330	201		245		0	0	325		16.50		3.80		310	
MCBRIDE	D	11/15/90	1300	155	C	189		0	0	1	U	0.21		0.07	CR	26	
MCBRIDE	N	11/15/90	1245	162	C	198		0	0	1	U	0.20		0.03	UCR	22	
MCBRIDE	XCB	11/15/90	1315	4	C	5		0	0	1	U	0.10	U	0.15	C	1	U

NOTES: 1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.
2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits; R - field duplicates outside expected range, U - less than detection limit, Z - value not useable for statistics.
3) Blanks indicate values not determined.

HUGHESVILLE GROUNDWATER DATA
Cation Data

Station	Sample Type	Sample Date	Sample Time	Hardness as CaCo3 (mg/l)	Calcium (mg/l)	Magnesium (mg/l)	Sodium (mg/l)	Potassium (mg/l)
AMAX-2	LD	11/30/90			270	113	22	3 A
AMAX-2	N	11/14/90	1650	1183	276	120	22	3 A
HMW-01	N	11/15/90	0900	1087	310	76	10	3 A
HMW-02	N	11/14/90	1615	1302	327	118	27	4 A
HMW-03	N	11/15/90	0950	194	43	21	195	16 A
HMW-04	N	11/15/90	1100	104	25	10	3	1 A
HMW-05	N	11/14/90	0940	934	224	91	29	4 A
HMW-06	N	11/14/90	1300	775	205	64	22	2 A
HMW-08	BFS	11/14/90	1115	544	132	52	290	272
HMW-08	D	11/14/90	1055	315	85	25	7	2 A
HMW-08	LD	11/29/90			86	25	8	2 A
HMW-08	N	11/14/90	1045	311	85	24	8	2 A
HMW-08	XCB	11/14/90	1105	7 U	1 U	1 U	1 U	1 U
MCBRIDE	BFS	11/15/90	1330	537	131	51	290	272
MCBRIDE	D	11/15/90	1300	192	54	14	2	1 UA
MCBRIDE	N	11/15/90	1245	197	56	14	2	1 UA
MCBRIDE	XCB	11/15/90	1315	7 U	1 U	1 U	1 U	1 U

NOTES: 1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.

2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit. N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not useable for statistics.

3) Blanks indicate values not determined.

APPENDIX C-2

SOILS/MINE WASTE LABORATORY, GRADATION, AND HYDROMETER DATA BASE

HUGHESVILLE SOILS/MINE WASTE LABORATORY ANALYSES
Physical Properties

Station	Type	Sample Type	Sample Date	Lab Number	Top Interval (Inches)	Bottom Interval (Inches)	Field pH (s.u.)	Electrical Conductivity (Dseimens/mm)	Sample Texture	Percent Saturation
SS-100	N	STREAM TAILS	10/16/90	109061	0	1	2.7	0.8		21.4
SS-102	N	STREAM TAILS	10/16/90	109064	0	1	3.0	2.4	LOAMY SAND	23.3
SS-105	N	STREAM TAILS	10/16/90	109067	0	1	2.9	0.5		21.1
SS-107	N	MILL TAILS	10/16/90	109070	0	1	1.6	37.3	SANDY LOAM	21.6
SS-107	LD	MILL TAILS	10/16/90	109070	0	1	1.6	38.1	SANDY LOAM	22.4
SS-109	N	MILL TAILS	10/16/90	109052	0	1	1.4	45.7	SANDY LOAM	29.1
SS-110	N	MILL TAILS	10/16/90	109056	0	1	1.6	29.6	LOAM	31.8
SS-112	N	MILL TAILS	10/16/90	109059	0	1	1.6	30.0	CLAY LOAM	35.4
SS-115	N	WASTE ROCK	10/17/90	109032	0	1	2.2	3.2	LOAMY SAND	23.7
SS-117	N	WASTE ROCK	10/17/90	109034	0	1	2.2	1.5	SANDY LOAM	25.9
SS-124	N	WASTE ROCK	10/17/90	109040	0	1	2.1	2.7	SANDY LOAM	28.9
SS-124	LD	WASTE ROCK	10/17/90	109040	0	1	2.1	2.6		30.1
SS-130	N	WASTE ROCK	10/18/90	109043	0	1	2.6	0.2	SANDY LOAM	30.0
SS-133	N	STREAM TAILS	10/18/90	109045	0	1	2.0	4.0	SANDY LOAM	25.0
SS-135	N	WASTE ROCK	10/18/90	109048	0	1	1.9	4.1	LOAMY SAND	25.5
SS-137	N	WASTE ROCK	10/15/90	109102	0	1	5.3	4.7	SANDY LOAM	25.7
SS-150	BFS	STANDARD	11/19/90	109283	0					
SS-160	BFS	STANDARD	11/19/90	109284	0					
SS-100	N	STREAM TAILS	10/16/90	109062	1	18	2.6	0.9		32.7
SS-105	N	STREAM TAILS	10/16/90	109068	1	6	2.9	0.4		28.1
SS-107	N	MILL TAILS	10/16/90	109071	1	66	1.6	25.9	LOAMY SAND	23.5
SS-109	N	MILL TAILS	10/16/90	109053	1	48	1.6	35.6	LOAMY SAND	24.9
SS-124	N	WASTE ROCK	10/17/90	109041	1	12	1.9	4.5	LOAMY SAND	24.0
SS-137	N	WASTE ROCK	10/15/90	109103	1	24	4.6	11.0	SANDY LOAM	31.0
SS-133	N	STREAM TAILS	10/18/90	109046	3	24	2.2	0.8	SANDY LOAM	34.9
SS-105	N	SOIL	10/16/90	109069	6	12	3.8	3.4		37.4
SS-102	N	STREAM TAILS	10/16/90	109065	8	48	4.1	3.2	SAND	30.3
SS-134	N	SOIL	10/18/90	109047	10	22	2.3	1.3		24.4
SS-115	N	WASTE ROCK	10/17/90	109033	12	36	2.1	4.7	SANDY LOAM	27.4
SS-124	N	WASTE ROCK	10/17/90	109042	12	40	2.1	1.6	LOAMY SAND	27.6
SS-130	N	WASTE ROCK	10/18/90	109044	12	30	2.0	2.7	SANDY LOAM	35.1

NOTES: 1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.
2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not useable for statistics.
3) Blanks indicate values not determined.

HUGHESVILLE SOILS/MINE WASTE LABORATORY ANALYSES
Physical Properties

Station	Type	Sample Type	Sample Date	Lab Number	Top Interval (Inches)	Bottom Interval (Inches)	Field pH (s.u.)	Electrical Conductivity (Dseimens/mm)	Sample Texture	Percent Saturation
SS-135	N	WASTE ROCK	10/18/90	109049	15	36	1.8	6.3	SANDY LOAM	27.4
SS-135	D	WASTE ROCK	10/18/90	109050	15	36	1.9	5.4		27.9
SS-135	LD	WASTE ROCK	10/18/90	109050	15	36	1.9	5.3		29.9
SS-100	N	SOIL	10/16/90	109063	18	26	3.2	0.6		30.1
SS-117	N	WASTE ROCK	10/17/90	109035	18	36	2.4	3.4	SANDY LOAM	37.6
SS-121	N	WASTE ROCK	10/17/90	109037	18	36	2.1	4.8		33.4
SS-121	D	WASTE ROCK	10/17/90	109038	18	36	2.0	5.7		37.8
SS-137	N	WASTE ROCK	10/15/90	109104	24	48	1.6	1.7	SANDY LOAM	32.8
SS-110	N	MILL TAILS	10/16/90	109057	36	54	1.6	44.0	LOAMY SAND	24.0
SS-117	N	WASTE ROCK	10/17/90	109036	36	48	2.2	4.0	SANDY LOAM	34.3
SS-102	N	STREAM TAILS	10/16/90	109066	48	60	4.0	0.5	LOAMY SAND	36.7
SS-109	N	MILL TAILS	10/16/90	109054	48	66	1.8	20.7	LOAMY SAND	23.0
SS-107	N	MILL TAILS	10/16/90	109051	66	72	1.6	14.4		38.1
SS-109	N	MILL TAILS	10/16/90	109055	66	132	1.7	20.1	SANDY LOAM	23.9
SS-110	N	MILL TAILS	10/16/90	109058	84	90	4.0	27.0	SILT LOAM	35.8
HMW5	N	WASTE ROCK	11/07/90	109105	120	132	2.6	6.7		24.6
SS-112	N	MILL TAILS	10/17/90	109039	156	178	1.5	29.4	SILT LOAM	75.2
SS-112	N	SOIL	10/16/90	109060	216	222	1.8	20.1	SANDY LOAM	33.2
SS-112	LD	SOIL	10/16/90	109060	216	222	1.8	28.6		33.4
HMW5	N	WASTE ROCK	11/07/90	109106	360	384	1.8	11.5		23.7

NOTES: 1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.
2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not useable for statistics.
3) Blanks indicate values not determined.

HUGHESVILLE SOILS/MINE WASTE LABORATORY ANALYSES
Total and Saturated Paste Extract Metals Data

Station	Type	Sample Type	Sample Date	Top Interval (Inches)	Bottom Interval (Inches)	Aluminum Total (mg/kg)	Aluminum Extract (mg/l)	Arsenic Total (mg/kg)		Arsenic Extract (mg/l)		Cadmium Total (mg/kg)	Cadmium Extract (mg/l)
SS-100	N	STREAM TAILS	10/16/90	0	1	2410	2.0	920	A	0.072		23.0	0.655
SS-102	N	STREAM TAILS	10/16/90	0	1	2510	0.5	610	A	0.053		9.0	0.061
SS-105	N	STREAM TAILS	10/16/90	0	1	1610	0.9	690	A	0.021		12.0	0.272
SS-107	N	MILL TAILS	10/16/90	0	1	1610	1050.0	540	A	20.000		13.0	4.920
SS-107	LD	MILL TAILS	10/16/90	0	1	1620	1090.0	520	A	180.000		13.0	4.830
SS-109	N	MILL TAILS	10/16/90	0	1				A				
SS-110	N	MILL TAILS	10/16/90	0	1				A				
SS-112	N	MILL TAILS	10/16/90	0	1	5600	1870.0	920	A	380.000		15.0	9.100
SS-115	N	WASTE ROCK	10/17/90	0	1	2290		720	A			7.4	
SS-117	N	WASTE ROCK	10/17/90	0	1	1910	11.0	299	A	0.021		8.1	0.075
SS-124	N	WASTE ROCK	10/17/90	0	1	3220	58.0	365	A	0.180		17.2	0.330
SS-124	LD	WASTE ROCK	10/17/90	0	1	2980	58.0	388	A	0.140		17.0	0.255
SS-130	N	WASTE ROCK	10/18/90	0	1	2390	0.4	510	A	0.010		14.0	0.013
SS-133	N	STREAM TAILS	10/18/90	0	1	1830	15.0	2010	A	0.092		44.0	1.520
SS-135	N	WASTE ROCK	10/18/90	0	1	2000	11.0	220	A	0.154		9.2	0.200
SS-137	N	WASTE ROCK	10/15/90	0	1	4400		270	A			37.0	
SS-150	BFS	STANDARD	11/19/90	0		13600		70				42.7	
SS-160	BFS	STANDARD	11/19/90	0		13300		73				42.7	
SS-100	N	STREAM TAILS	10/16/90	1	18	5180	4.0	2040	A	0.040		17.0	0.474
SS-105	N	STREAM TAILS	10/16/90	1	6	3290		1050	A			12.0	
SS-107	N	MILL TAILS	10/16/90	1	66	1260	206.0	730	A	22.000		22.0	2.370
SS-109	N	MILL TAILS	10/16/90	1	48				A				
SS-124	N	WASTE ROCK	10/17/90	1	12	1750	37.0	311	A	0.425		7.6	0.250
SS-137	N	WASTE ROCK	10/15/90	1	24	3920		490	A			28.0	
SS-133	N	STREAM TAILS	10/18/90	3	24	2350		1600	A			11.0	
SS-105	N	SOIL	10/16/90	6	12	6090		1910	A			25.0	
SS-102	N	STREAM TAILS	10/16/90	8	48	7390	1.5	160	A	0.005	U	14.0	1.200
SS-134	N	SOIL	10/18/90	10	22	5410		897	A			10.0	
SS-115	N	WASTE ROCK	10/17/90	12	36	2400		324	A			5.9	

NOTES: 1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.

2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not useable for statistics.

3) Blanks indicate values not determined.

HUGHESVILLE SOILS/MINE WASTE LABORATORY ANALYSES
Total and Saturated Paste Extract Metals Data

Station	Type	Sample Type	Sample Date	Top Interval (inches)	Bottom Interval (inches)	Aluminum Total (mg/kg)	Aluminum Extract (mg/l)	Arsenic Total (mg/kg)		Arsenic Extract (mg/l)	Cadmium Total (mg/kg)	Cadmium Extract (mg/l)
SS-124	N	WASTE ROCK	10/17/90	12	40	2410	2.1	380	A	0.023	4.4	0.024
SS-130	N	WASTE ROCK	10/18/90	12	30	2360		840	A		16.0	
SS-135	N	WASTE ROCK	10/18/90	15	36	2090	30.0	116	A	0.407	10.0	0.698
SS-135	D	WASTE ROCK	10/18/90	15	36	3150	16.0	160	A	0.341	12.0	0.606
SS-135	LD	WASTE ROCK	10/18/90	15	36	3190	16.0	164	A	0.253	14.0	0.596
SS-100	N	SOIL	10/16/90	18	26	13700		8	A		9.0	
SS-117	N	WASTE ROCK	10/17/90	18	36	2620	59.0	312	A	0.040	8.3	0.388
SS-121	N	WASTE ROCK	10/17/90	18	36	3910	74.0	457	A	0.110	8.4	0.339
SS-121	D	WASTE ROCK	10/17/90	18	36	4370	78.0	1030	A	0.400	9.9	0.236
SS-137	N	WASTE ROCK	10/15/90	24	48	1810		670	A		25.0	
SS-110	N	MILL TAILS	10/16/90	36	54				A			
SS-117	N	WASTE ROCK	10/17/90	36	48	2360	29.0	312	A	0.076	11.3	0.346
SS-102	N	STREAM TAILS	10/16/90	48	60	9110		16	A		20.0	
SS-109	N	MILL TAILS	10/16/90	48	66	1820	250.0	698	A	13.000	27.0	1.680
SS-107	N	MILL TAILS	10/16/90	66	72	6470		500	A		9.7	
SS-109	N	MILL TAILS	10/16/90	66	132	2220	390.0	2140	A	370.000	68.0	3.710
SS-110	N	MILL TAILS	10/16/90	84	90				A			
HMW5	N	WASTE ROCK	11/07/90	120	132	4040		560	A		18.8	
SS-112	N	MILL TAILS	10/17/90	156	178	5550	1400.0	1580	A	500.000	17.1	9.900
SS-112	N	SOIL	10/16/90	216	222	10700	1380.0	660	A	200.000	12.0	5.800
SS-112	LD	SOIL	10/16/90	216	222	10800	1200.0	640	A	200.000	12.0	5.500
HMW5	N	WASTE ROCK	11/07/90	360	384	3410		340	A		9.7	

NOTES: 1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.

2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not useable for statistics.

3) Blanks indicate values not determined.

HUGHESVILLE SOILS/MINE WASTE LABORATORY ANALYSES
Total and Saturated Paste Extract Metals Data

Station	Type	Sample Type	Sample Date	Top Interval (Inches)	Bottom Interval (Inches)	Chromium Total (mg/kg)	Chromium Extract (mg/l)	Copper Total (mg/kg)	Copper Extract (mg/l)	Iron Total (mg/kg)	Iron Extract (mg/l)
SS-100	N	STREAM TAILS	10/16/90	0	1	2 U	0.02 U	220	0.54	23200	7.20
SS-102	N	STREAM TAILS	10/16/90	0	1	2 U	0.02 U	138	0.29	22900	0.57
SS-105	N	STREAM TAILS	10/16/90	0	1	2 U	0.04	349	0.32	26100	1.30
SS-107	N	MILL TAILS	10/16/90	0	1	2 U	0.20 U	254	44.00	44200	30700.00
SS-107	LD	MILL TAILS	10/16/90	0	1	2 U	0.20 U	254	43.00	43400	31100.00
SS-109	N	MILL TAILS	10/16/90	0	1						
SS-110	N	MILL TAILS	10/16/90	0	1						
SS-112	N	MILL TAILS	10/16/90	0	1	4	2.06	312	116.00	50400	43800.00
SS-115	N	WASTE ROCK	10/17/90	0	1	3		46		30700	
SS-117	N	WASTE ROCK	10/17/90	0	1	2	0.08	88	0.66	29100	8.00
SS-124	N	WASTE ROCK	10/17/90	0	1	4	0.15	57	0.80	27300	45.00
SS-124	LD	WASTE ROCK	10/17/90	0	1	3	0.10	55	0.55	25900	43.00
SS-130	N	WASTE ROCK	10/18/90	0	1	2 U	0.02 U	332	0.12	33300	0.41
SS-133	N	STREAM TAILS	10/18/90	0	1	34	0.04	568	3.65	65400	120.00
SS-135	N	WASTE ROCK	10/18/90	0	1	2 U	0.04	40	0.71	17400	220.00
SS-137	N	WASTE ROCK	10/15/90	0	1	28		2140		134000	
SS-150	BFS	STANDARD	11/19/90	0		50		160		19500	
SS-160	BFS	STANDARD	11/19/90	0		51		190		19800	
SS-100	N	STREAM TAILS	10/16/90	1	18	10	0.02	130	1.00	60000	9.60
SS-105	N	STREAM TAILS	10/16/90	1	6	2 U		410		34400	
SS-107	N	MILL TAILS	10/16/90	1	66	2 U	0.20 U	179	18.00	78400	9850.00
SS-109	N	MILL TAILS	10/16/90	1	48						
SS-124	N	WASTE ROCK	10/17/90	1	12	2 U	0.10 U	31	0.85	16600	181.00
SS-137	N	WASTE ROCK	10/15/90	1	24	28		483		121000	
SS-133	N	STREAM TAILS	10/18/90	3	24	4		206		25200	
SS-105	N	SOIL	10/16/90	6	12	12		580		73600	
SS-102	N	STREAM TAILS	10/16/90	8	48	14	0.12	268	1.20	37300	0.19
SS-134	N	SOIL	10/18/90	10	22	10		36		37000	
SS-115	N	WASTE ROCK	10/17/90	12	36	2		76		27500	

NOTES: 1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.

2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not useable for statistics.

3) Blanks indicate values not determined.

HUGHESVILLE SOILS/MINE WASTE LABORATORY ANALYSES
Total and Saturated Paste Extract Metals Data

Station	Type	Sample Type	Sample Date	Top Interval (Inches)	Bottom Interval (Inches)	Chromium Total (mg/kg)	Chromium Extract (mg/l)	Copper Total (mg/kg)	Copper Extract (mg/l)	Iron Total (mg/kg)	Iron Extract (mg/l)
SS-124	N	WASTE ROCK	10/17/90	12	40	2 U	0.02	11	0.19	15700	5.80
SS-130	N	WASTE ROCK	10/18/90	12	30	2 U		172		40100	
SS-135	N	WASTE ROCK	10/18/90	15	36	2 U	0.05	129	2.22	15400	490.00
SS-135	D	WASTE ROCK	10/18/90	15	36	2 U	0.04	158	1.49	17900	350.00
SS-135	LD	WASTE ROCK	10/18/90	15	36	2 U	0.05	160	1.59	18500	360.00
SS-100	N	SOIL	10/16/90	18	26	47		187		23500	
SS-117	N	WASTE ROCK	10/17/90	18	36	4	0.09	93	2.12	29300	9.70
SS-121	N	WASTE ROCK	10/17/90	18	36	6	0.12	32	1.60	41100	82.00
SS-121	D	WASTE ROCK	10/17/90	18	36	7	0.05	37	2.10	54900	230.00
SS-137	N	WASTE ROCK	10/15/90	24	48	7		845		148000	
SS-110	N	MILL TAILS	10/16/90	36	54						
SS-117	N	WASTE ROCK	10/17/90	36	48	3	0.04	111	1.01	39600	47.00
SS-102	N	STREAM TAILS	10/16/90	48	60	20		369		12300	
SS-109	N	MILL TAILS	10/16/90	48	66	2 U	0.66	157	23.00	91500	4900.00
SS-107	N	MILL TAILS	10/16/90	66	72	7		79		27300	
SS-109	N	MILL TAILS	10/16/90	66	132	2 U	3.53	688	290.00	141000	8100.00
SS-110	N	MILL TAILS	10/16/90	84	90						
HMW5	N	WASTE ROCK	11/07/90	120	132	7		106		37800	
SS-112	N	MILL TAILS	10/17/90	156	178	10	4.10	314	305.00	81000	48200.00
SS-112	N	SOIL	10/16/90	216	222	14	3.28	190	150.00	32800	16400.00 U
SS-112	LD	SOIL	10/16/90	216	222	14	3.15	190	130.00	33900	14700.00
HMW5	N	WASTE ROCK	11/07/90	360	384	7		55		39700	

NOTES: 1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.

2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not useable for statistics.

3) Blanks indicate values not determined.

HUGHESVILLE SOILS/MINE WASTE LABORATORY ANALYSES

Total and Saturated Paste Extract Metals Data

Station	Type	Sample Type	Sample Date	Top Interval (Inches)	Bottom Interval (Inches)	Lead Total (mg/kg)	Lead Extract (mg/l)	Manganese Total (mg/kg)	Manganese Extract (mg/l)	Mercury Total (mg/kg)	Mercury Extract (mg/l)
SS-100	N	STREAM TAILS	10/16/90	0	1	13500	2.57	28	3.00	0.72	0.002 U
SS-102	N	STREAM TAILS	10/16/90	0	1	6130	0.13	38	0.35	0.27	0.013
SS-105	N	STREAM TAILS	10/16/90	0	1	12200	5.90	26	1.79	0.62	0.002 U
SS-107	N	MILL TAILS	10/16/90	0	1	4340	2.41	26	3.11	0.35	0.002 U
SS-107	LD	MILL TAILS	10/16/90	0	1	4000	2.46	18	3.47	0.36	0.002 U
SS-109	N	MILL TAILS	10/16/90	0	1						
SS-110	N	MILL TAILS	10/16/90	0	1						
SS-112	N	MILL TAILS	10/16/90	0	1	10600	0.47	1630	6100.00	0.42	0.002 U
SS-115	N	WASTE ROCK	10/17/90	0	1	11100		38		0.20	
SS-117	N	WASTE ROCK	10/17/90	0	1	10200	4.32	16	2.08	0.66	0.004
SS-124	N	WASTE ROCK	10/17/90	0	1	34600	3.40	39	17.00	0.52	0.002 U
SS-124	LD	WASTE ROCK	10/17/90	0	1	40700	3.50	36	15.00	0.52	0.002 U
SS-130	N	WASTE ROCK	10/18/90	0	1	34000	5.50	29	0.12	2.80	0.011
SS-133	N	STREAM TAILS	10/18/90	0	1	18600	1.17	63	1.90	2.10	0.004 U
SS-135	N	WASTE ROCK	10/18/90	0	1	22000	3.03	13	1.46	0.51	0.002 U
SS-137	N	WASTE ROCK	10/15/90	0	1	8690		15600		0.07	
SS-150	BFS	STANDARD	11/19/90	0		32		350		1.20	
SS-160	BFS	STANDARD	11/19/90	0		30		350		1.40	
SS-100	N	STREAM TAILS	10/16/90	1	18	6340	0.16	180	2.20	0.36	0.045
SS-105	N	STREAM TAILS	10/16/90	1	6	18500		76		0.85	
SS-107	N	MILL TAILS	10/16/90	1	66	2310	3.66	6	1.90	0.45	0.004
SS-109	N	MILL TAILS	10/16/90	1	48						
SS-124	N	WASTE ROCK	10/17/90	1	12	3270	2.70	9	5.05	0.20	0.002 U
SS-137	N	WASTE ROCK	10/15/90	1	24	1740		5100		0.27	
SS-133	N	STREAM TAILS	10/18/90	3	24	18000		40		1.30	
SS-105	N	SOIL	10/16/90	6	12	1540		10900		0.24	
SS-102	N	STREAM TAILS	10/16/90	8	48	451	0.29	1340	58.00	0.05	0.003
SS-134	N	SOIL	10/18/90	10	22	1030		1410		0.07	
SS-115	N	WASTE ROCK	10/17/90	12	36	4050		45		0.44	

NOTES: 1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.

2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not useable for statistics.

3) Blanks indicate values not determined.

HUGHESVILLE SOILS/MINE WASTE LABORATORY ANALYSES
Total and Saturated Paste Extract Metals Data

Station	Type	Sample Type	Sample Date	Top Interval (Inches)	Bottom Interval (Inches)	Lead Total (mg/kg)	Lead Extract (mg/l)	Manganese Total (mg/kg)	Manganese Extract (mg/l)	Mercury Total (mg/kg)	Mercury Extract (mg/l)
SS-124	N	WASTE ROCK	10/17/90	12	40	291	0.17	8	0.68	0.44	0.002 U
SS-130	N	WASTE ROCK	10/18/90	12	30	9170		38		1.80	
SS-135	N	WASTE ROCK	10/18/90	15	36	12200	2.55	31	17.00	1.60	0.002 U
SS-135	D	WASTE ROCK	10/18/90	15	36	22800	2.55	28	7.30	1.90	0.003
SS-135	LD	WASTE ROCK	10/18/90	15	36	22800	2.81	29	7.40	1.80	0.002
SS-100	N	SOIL	10/16/90	18	26	91		123		0.07	
SS-117	N	WASTE ROCK	10/17/90	18	36	23600	2.13	34	3.58	1.40	0.002 U
SS-121	N	WASTE ROCK	10/17/90	18	36	4210	2.07	26	2.64	0.59	0.002
SS-121	D	WASTE ROCK	10/17/90	18	36	9360	1.43	29	3.13	0.73	5.020
SS-137	N	WASTE ROCK	10/15/90	24	48	4100		2040		0.32	
SS-110	N	MILL TAILS	10/16/90	36	54						
SS-117	N	WASTE ROCK	10/17/90	36	48	24600	2.26	31	3.73	1.30	0.002 U
SS-102	N	STREAM TAILS	10/16/90	48	60	408		94		0.08	
SS-109	N	MILL TAILS	10/16/90	48	66	2070	2.92	67	280.00	0.44	0.002 U
SS-107	N	MILL TAILS	10/16/90	66	72	2810		10		0.20	
SS-109	N	MILL TAILS	10/16/90	66	132	4460	8.00	115	420.00	0.94	0.002 U
SS-110	N	MILL TAILS	10/16/90	84	90						
1MW5	N	WASTE ROCK	11/07/90	120	132	11500		216		0.64	
SS-112	N	MILL TAILS	10/17/90	156	178	10000	2.40	3290	8700.00	1.00	1.250
SS-112	N	SOIL	10/16/90	216	222	720	0.20 U	1400	5100.00	0.10	0.020 U
SS-112	LD	SOIL	10/16/90	216	222	680	0.53	1440	4850.00	0.10	0.020 U
1MW5	N	WASTE ROCK	11/07/90	360	384	1490		49		0.26	

NOTES: 1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.

2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not useable for statistics.

3) Blanks indicate values not determined.

HUGHESVILLE SOILS/MINE WASTE LABORATORY ANALYSES

Total and Saturated Paste Extract Metals Data

Station	Type	Sample Type	Sample Date	Top Interval (Inches)	Bottom Interval (Inches)	Nickel Total (mg/kg)		Nickel Extract (mg/l)		Silver Total (mg/kg)	Silver Extract (mg/l)		Zinc Total (mg/kg)	Zinc Extract (mg/l)
SS-100	N	STREAM TAILS	10/16/90	0	1	13.0	A	0.02	U	150	0.02	U	3010	96.00
SS-102	N	STREAM TAILS	10/16/90	0	1	10.0	A	0.02	U	43	0.02	U	553	8.80
SS-105	N	STREAM TAILS	10/16/90	0	1	11.0	A	0.02	U	229	0.02		1450	38.00
SS-107	N	MILL TAILS	10/16/90	0	1	14.0	A	3.98		109	0.24		636	130.00
SS-107	LD	MILL TAILS	10/16/90	0	1	16.0	A	4.17		108	0.25		588	130.00
SS-109	N	MILL TAILS	10/16/90	0	1									
SS-110	N	MILL TAILS	10/16/90	0	1									
SS-112	N	MILL TAILS	10/16/90	0	1	14.0		5.71		72	0.84		731	1050.00
SS-115	N	WASTE ROCK	10/17/90	0	1	5.0	A			25			314	2.20
SS-117	N	WASTE ROCK	10/17/90	0	1	3.0	A	0.06		38	0.02	U	453	11.00
SS-124	N	WASTE ROCK	10/17/90	0	1	5.0	A	0.15		104	0.10	U	2010	42.00
SS-124	LD	WASTE ROCK	10/17/90	0	1	5.0	A	0.25		107	0.10	U	2150	42.00
SS-130	N	WASTE ROCK	10/18/90	0	1	8.0		0.04		176	0.02	U	792	2.16
SS-133	N	STREAM TAILS	10/18/90	0	1	17.0		0.15		440	0.02	U	4830	245.00
SS-135	N	WASTE ROCK	10/18/90	0	1	13.0		0.13		43	0.02	U	388	24.00
SS-137	N	WASTE ROCK	10/15/90	0	1	42.0				132			1580	
SS-150	BFS	STANDARD	11/19/90	0		120.0				76			350	
SS-160	BFS	STANDARD	11/19/90	0		130.0				83			360	
SS-100	N	STREAM TAILS	10/16/90	1	18	28.0	A	0.02	U	80	0.02	U	630	64.00
SS-105	N	STREAM TAILS	10/16/90	1	6	12.0	A			156			1090	
SS-107	N	MILL TAILS	10/16/90	1	66	22.0	A	1.45		113	0.26		950	140.00
SS-109	N	MILL TAILS	10/16/90	1	48									
SS-124	N	WASTE ROCK	10/17/90	1	12	6.0	A	0.10		39	0.10	U	262	35.00
SS-137	N	WASTE ROCK	10/15/90	1	24	30.0				33			613	
SS-133	N	STREAM TAILS	10/18/90	3	24	10.0				170			558	
SS-105	N	SOIL	10/16/90	6	12	27.0	A			18			1070	
SS-102	N	STREAM TAILS	10/16/90	8	48	24.0	A	0.19		4	0.03		1220	401.00
SS-134	N	SOIL	10/18/90	10	22	16.0				4			249	
SS-115	N	WASTE ROCK	10/17/90	12	36	6.0	A			18			130	

NOTES: 1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.

2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not useable for statistics.

3) Blanks indicate values not determined.

HUGHESVILLE SOILS/MINE WASTE LABORATORY ANALYSES
Total and Saturated Paste Extract Metals Data

Station	Type	Sample Type	Sample Date	Top Interval (Inches)	Bottom Interval (Inches)	Nickel Total (mg/kg)	Nickel Extract (mg/l)	Silver Total (mg/kg)	Silver Extract (mg/l)	Zinc Total (mg/kg)	Zinc Extract (mg/l)
SS-124	N	WASTE ROCK	10/17/90	12	40	8.0 A	0.02	4	0.02 U	78	3.88
SS-130	N	WASTE ROCK	10/18/90	12	30	10.0		96		626	
SS-135	N	WASTE ROCK	10/18/90	15	36	8.0	0.21	56	0.02 U	1000	98.00
SS-135	D	WASTE ROCK	10/18/90	15	36	10.0	0.15	115	0.02 U	1680	80.00
SS-135	LD	WASTE ROCK	10/18/90	15	36	10.0	0.16	106	0.02 U	2000	82.00
SS-100	N	SOIL	10/16/90	18	26	37.0 A		2 U		478	
SS-117	N	WASTE ROCK	10/17/90	18	36	7.0 A	0.02 U	56	0.02 U	340	54.00
SS-121	N	WASTE ROCK	10/17/90	18	36	4.0 A	0.08	26	0.11	313	34.00
SS-121	D	WASTE ROCK	10/17/90	18	36	8.0 A	0.02 U	21	0.02	184	38.00
SS-137	N	WASTE ROCK	10/15/90	24	48	22.0		52		503	
SS-110	N	MILL TAILS	10/16/90	36	54						
SS-117	N	WASTE ROCK	10/17/90	36	48	9.7 A	0.07	74	0.02	975	66.00
SS-102	N	STREAM TAILS	10/16/90	48	60	22.0 A		2		858	
SS-109	N	MILL TAILS	10/16/90	48	66	22.0	1.34	68	0.14	905	100.00
SS-107	N	MILL TAILS	10/16/90	66	72	12.0 A		19		562	
SS-109	N	MILL TAILS	10/16/90	66	132	38.0	2.23	113	0.30	76	390.00
SS-110	N	MILL TAILS	10/16/90	84	90						
HMW5	N	WASTE ROCK	11/07/90	120	132	8.9 A		64		2800	
SS-112	N	MILL TAILS	10/17/90	156	178	13.0	5.02	54	1.25	860	930.00
SS-112	N	SOIL	10/16/90	216	222	18.0	3.83	6	0.89	321	660.00
SS-112	LD	SOIL	10/16/90	216	222	21.0	3.73	6	0.84	321	550.00
HMW5	N	WASTE ROCK	11/07/90	360	384	9.0 A		8		204	

NOTES:
1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.
2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not useable for statistics.
3) Blanks indicate values not determined.

HUGHESVILLE SOILS/MINE WASTE LABORATORY ANALYSIS

Sulfur Fractionation

Station	Type	Sample Type	Sample Date	Top Interval	Bottom Interval	Total Sulfur (%)	Sulfate Sulfur (%)	Jarosite Sulfur (%)	Pyritic Sulfur (%)	Residual Sulfur (%)
SS-100	N	STREAM TAILS	10/16/90	0	1					
SS-102	N	STREAM TAILS	10/16/90	0	1					
SS-105	N	STREAM TAILS	10/16/90	0	1					
SS-107	N	MILL TAILS	10/16/90	0	1	3.82	0.73	0.45	1.39	1.25
SS-107	LD	MILL TAILS	10/16/90	0	1	3.83	0.71	0.45	1.21	1.46
SS-109	N	MILL TAILS	10/16/90	0	1					
SS-110	N	MILL TAILS	10/16/90	0	1					
SS-112	N	MILL TAILS	10/16/90	0	1					
SS-115	N	WASTE ROCK	10/17/90	0	1					
SS-117	N	WASTE ROCK	10/17/90	0	1					
SS-124	N	WASTE ROCK	10/17/90	0	1					
SS-124	LD	WASTE ROCK	10/17/90	0	1					
SS-130	N	WASTE ROCK	10/18/90	0	1					
SS-133	N	STREAM TAILS	10/18/90	0	1					
SS-135	N	WASTE ROCK	10/18/90	0	1					
SS-137	N	WASTE ROCK	10/15/90	0	1					
SS-150	BFS	STANDARD	11/19/90	0						
SS-160	BFS	STANDARD	11/19/90	0						
SS-100	N	STREAM TAILS	10/16/90	1	18					
SS-105	N	STREAM TAILS	10/16/90	1	6					
SS-107	N	MILL TAILS	10/16/90	1	66	8.96	0.38	0.29	5.65	2.64
SS-109	N	MILL TAILS	10/16/90	1	48					
SS-124	N	WASTE ROCK	10/17/90	1	12					
SS-137	N	WASTE ROCK	10/15/90	1	24	5.81	1.41	1.41	1.44	1.55
SS-133	N	STREAM TAILS	10/18/90	3	24					
SS-105	N	SOIL	10/16/90	6	12					
SS-102	N	STREAM TAILS	10/16/90	8	48	0.37	0.10	0.02	0.20	0.01
SS-134	N	SOIL	10/18/90	10	22					
SS-115	N	WASTE ROCK	10/17/90	12	36	0.97	0.68	0.09	0.11	0.09

NOTES: 1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.

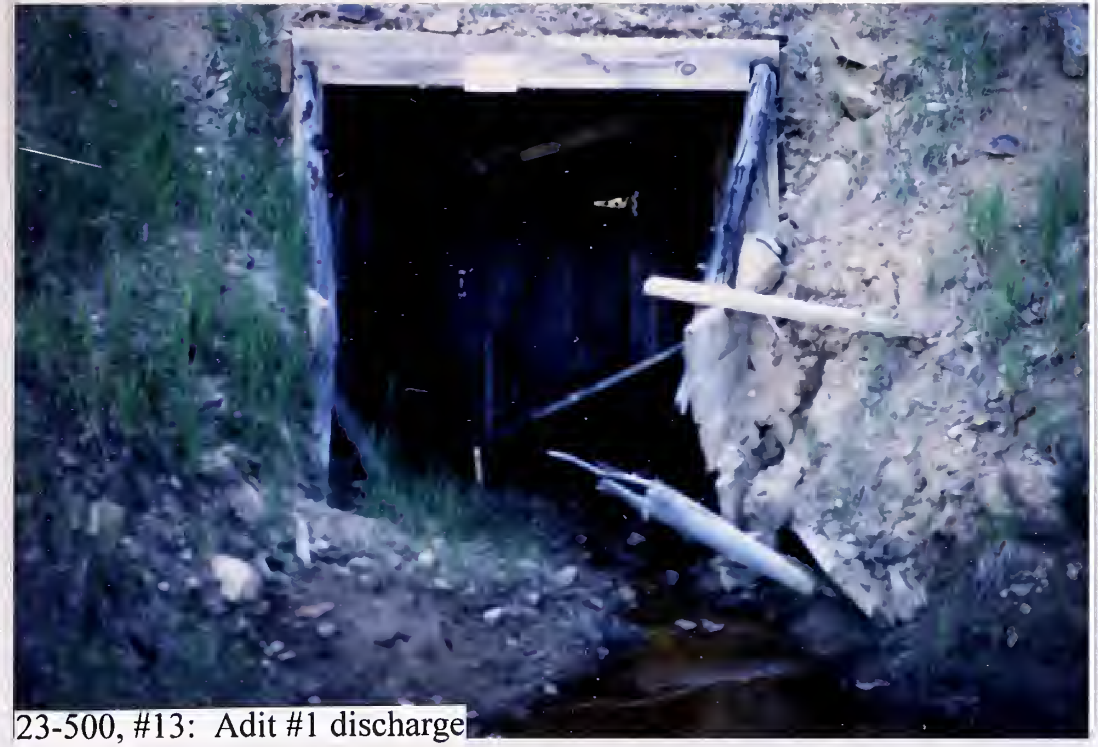
2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not useable for statistics.

3) Blanks indicate values not determined.

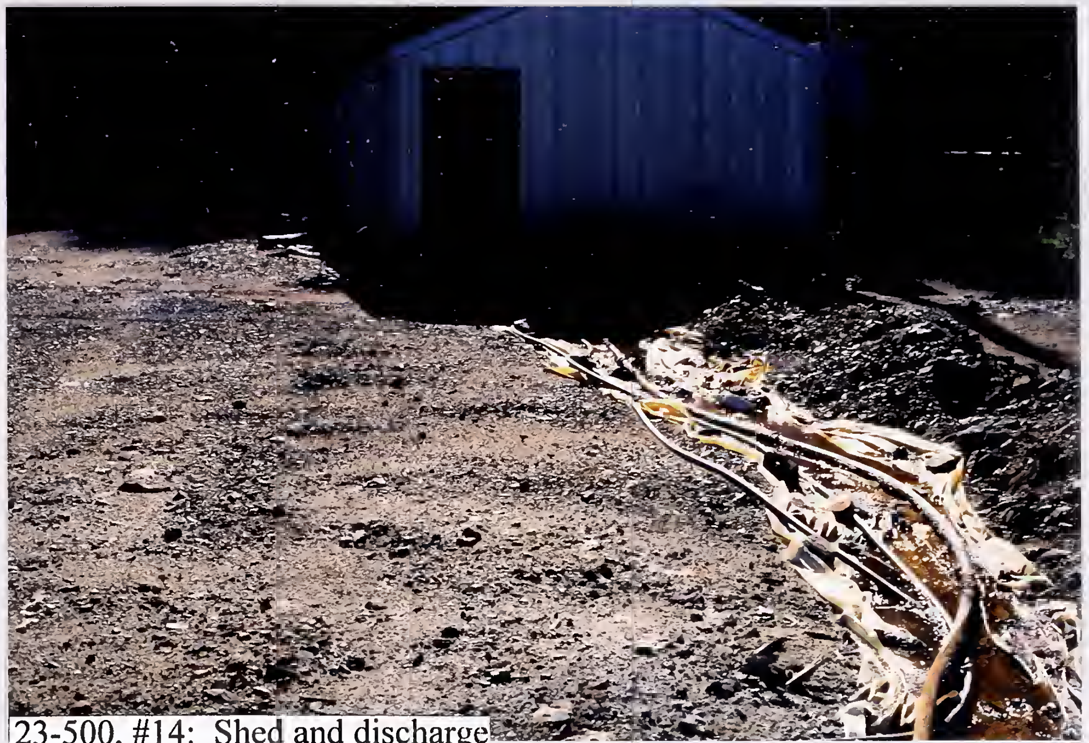
HUGHESVILLE SOILS/MINE WASTE LABORATORY ANALYSIS
Sulfur Fractionation

Station	Type	Sample Type	Sample Date	Top Interval	Bottom Interval	Total Sulfur (%)	Sulfate Sulfur (%)	Jarosite Sulfur (%)	Pyritic Sulfur (%)	Residual Sulfur (%)
SS-124	N	WASTE ROCK	10/17/90	12	40					
SS-130	N	WASTE ROCK	10/18/90	12	30	1.58	1.07	0.04	0.39	0.08
SS-135	N	WASTE ROCK	10/18/90	15	36					
SS-135	D	WASTE ROCK	10/18/90	15	36					
SS-135	LD	WASTE ROCK	10/18/90	15	36					
SS-100	N	SOIL	10/16/90	18	26					
SS-117	N	WASTE ROCK	10/17/90	18	36	1.32	0.87	0.10	0.10	0.34
SS-121	N	WASTE ROCK	10/17/90	18	36					
SS-121	D	WASTE ROCK	10/17/90	18	36					
SS-137	N	WASTE ROCK	10/15/90	24	48	5.21	1.59	1.88	0.91	0.83
SS-110	N	MILL TAILS	10/16/90	36	54	9.53	0.13	0.48	7.58	1.34
SS-117	N	WASTE ROCK	10/17/90	36	48	2.29	1.22	0.43	0.30	0.34
SS-102	N	STREAM TAILS	10/16/90	48	60	0.13	0.01	0.07	0.06	0.01
SS-109	N	MILL TAILS	10/16/90	48	66					
SS-107	N	MILL TAILS	10/16/90	66	72					
SS-109	N	MILL TAILS	10/16/90	66	132					
SS-110	N	MILL TAILS	10/16/90	84	90	9.45	0.32	0.91	6.30	1.92
HMW5	N	WASTE ROCK	11/07/90	120	132					
SS-112	N	MILL TAILS	10/17/90	156	178	6.22	1.20	1.74	2.30	0.98
SS-112	N	SOIL	10/16/90	216	222					
SS-112	LD	SOIL	10/16/90	216	222					
HMW5	N	WASTE ROCK	11/07/90	360	384					

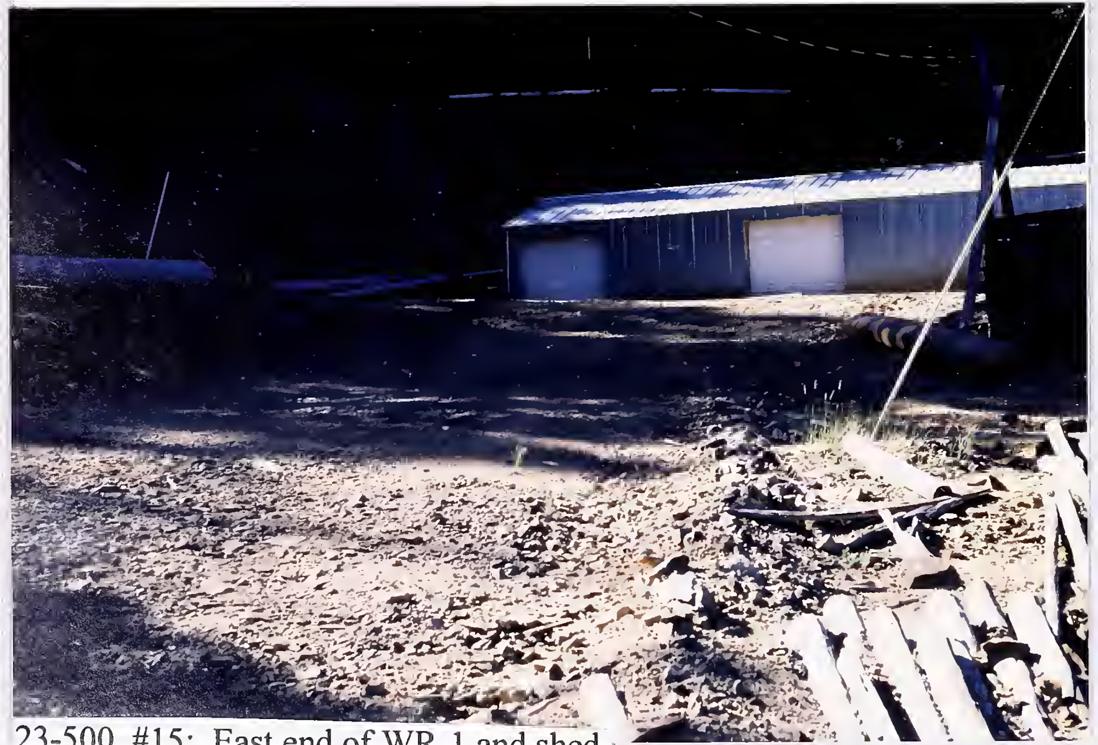
NOTES:
1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.
2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not useable for statistics.
3) Blanks indicate values not determined.



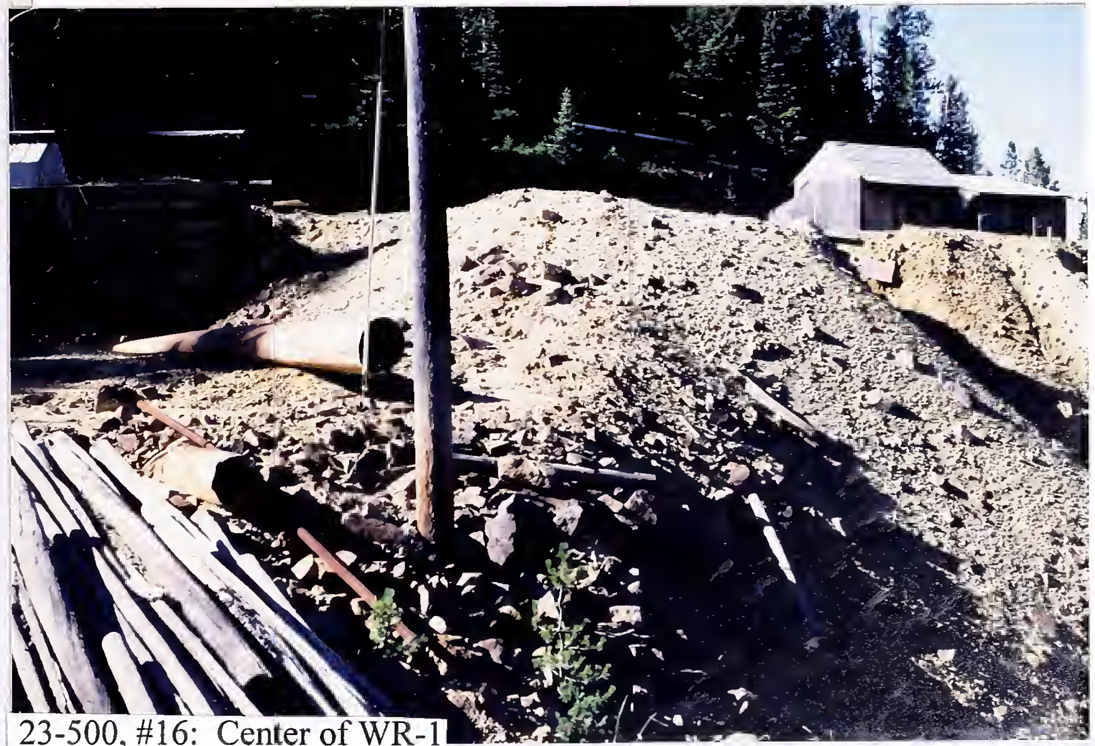
23-500, #13: Adit #1 discharge



23-500, #14: Shed and discharge



23-500, #15: East end of WR-1 and shed



23-500, #16: Center of WR-1

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: RONCOR/AMAX SAPPHIRE **PA#:** 23-501

Date: September 10, 1993 **Time:** 0900-1300

Field Team Leader: Bullock, Pioneer

Sampling Personnel: S. Babits, Pioneer

Visitors: Earl McCurley, Tim Pfahler, John Koerth, MDSL
Robin Strathy, USFS\Lewis & Clark Forest, Geologist

Weather/Seasonality Observations: Calm; clear; approx. 55°F.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number)**:** No photos or video were taken.

General Comments/Observations (not covered specifically in attached Inventory Forms)**:** Site investigated briefly while conducting investigation of the Vortex mine.

Other Hazardous Materials/Substances Present: Appeared to be lube oil and diesel fuel for equipment.

General Comments on Potential Remedial Alternatives: Minor grading and revegetation.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): RONCOR/AMAX SAPPHIRE **PA#:** 23-501

Legal Description: **T** 13N **;R** 11E **;Sec.** 20 , NE **1/4** SE **1/4** ____ **1/4**
T 13N **;R** 11E **;Sec.** 21 , NW **1/4** SW **1/4** ____ **1/4**

County: JUDITH BASIN **Mining District:** YOGO

Latitude: N 46° 52' 20" **Longitude:** W 110° 21' 49"

Primary Drainage Basin and Code: Judith River/10040103
Secondary Drainage Basin: Yogo Creek

USGS Quadrangle map name(s): Indian Hill/Woodhurst Mountain

Mine Type/Commodities: Open pit/Yogo sapphires

Activity Status: Active ___**,Inactive/Exploration** X **,Abandoned** ___.

Ownership: Known Y X **N** ___**; private/public?** Private
Owner, Agent, or Contact (Include address and phone when available)**:** Roncor, Inc., 2056 S. Barrington Avenue, Los Angeles, CA 90025.

Relationship to other mines/sites in the area/district: Adjacent to the active Vortex mine (23-027) inventoried in 1993.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? Mine has operated intermittently since 1991 under a small miner exclusion issued to Roncor, Inc. A reclamation bond posted by Intergem, Inc., was forfeited. Amax, Inc., has been conducting exploration activities on these claims since 1991. Portals are closed with steel doors, locked, and signed (11-2-93). Roncor did grade and seed several small areas above the plant site, yet said to be unsatisfactory.

General site features: Elevation 5300'**, Slope** 0-5°**,**
Aspect Northern

Land use: Mining X**, Recreational** ___**, Residential** ___**, Urban** ___**,**
Agricultural X**, Other(Specify)** ___

Area of disturbed/unvegetated lands? Approx. 3 **acre(s).**
Site Dimensions: 1,000 feet x 100 feet

Predominant vegetation types: Lodgepole pine, Cottonwood, willows, grasses

Access: roads - good (paved)___,poor (maintained dirt road)___, 4wd X ,trail___.

Other logistical considerations (proximity to other sites). Adjacent to the Vortex mine (23-027)

Well logs within 1 mile radius; (Attach MBMG Well Log Printout(s): There are no wells reported within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site lies on the south side of Yogo Creek in the 10-year floodplain. The site is located approximately 5 miles upstream of Yogo Creek's confluence with the Middle Fork Judith River.

Mining/milling history, ore type/tenor, host rock, gangue: No detailed account of past mining was located. Roncor, Inc., has been conducting open pit and placer mining since 1991.

Mine Operation?

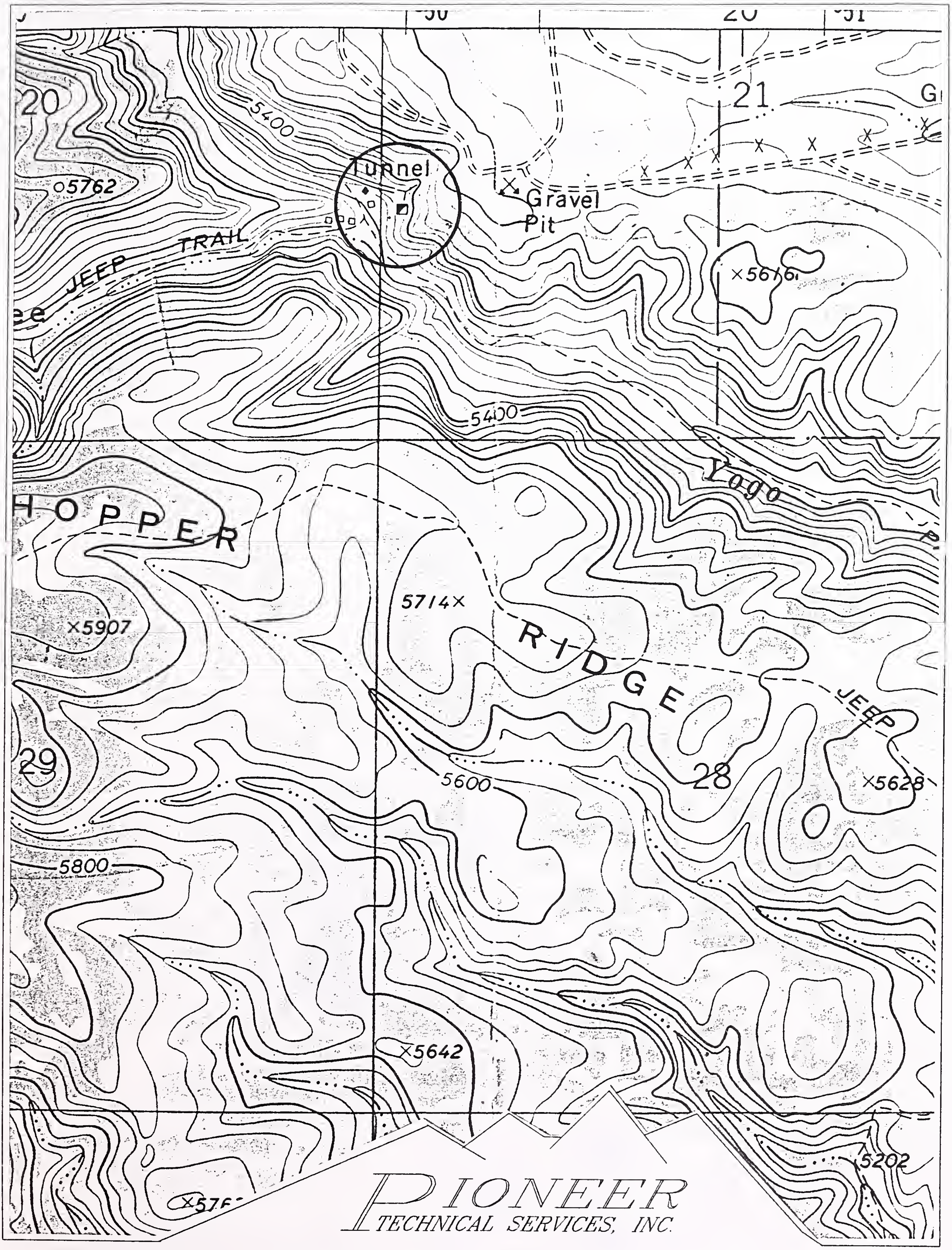
Shafts -	**Yes** X ,	**No**___,	**#** 1 ,	**Comment** Exploration stope
Adits -	**Yes** X ,	**No**___,	**#** 1 ,	**Comment**___
Pits -	**Yes** X ,	**No**___,	**#** ? ,	**Comment** Several pits & trenches
Placers -	**Yes**___,	**No** X ,	**#**___,	**Comment**___
Other -	**Yes**___,	**No** X ,	**#**___,	**Comment**___

Mill Operation? Yes X , **No**___. **If yes answer the next three questions:**

Period(s) of Operation: Current wash plant 1991 to present; previous milling has occurred.

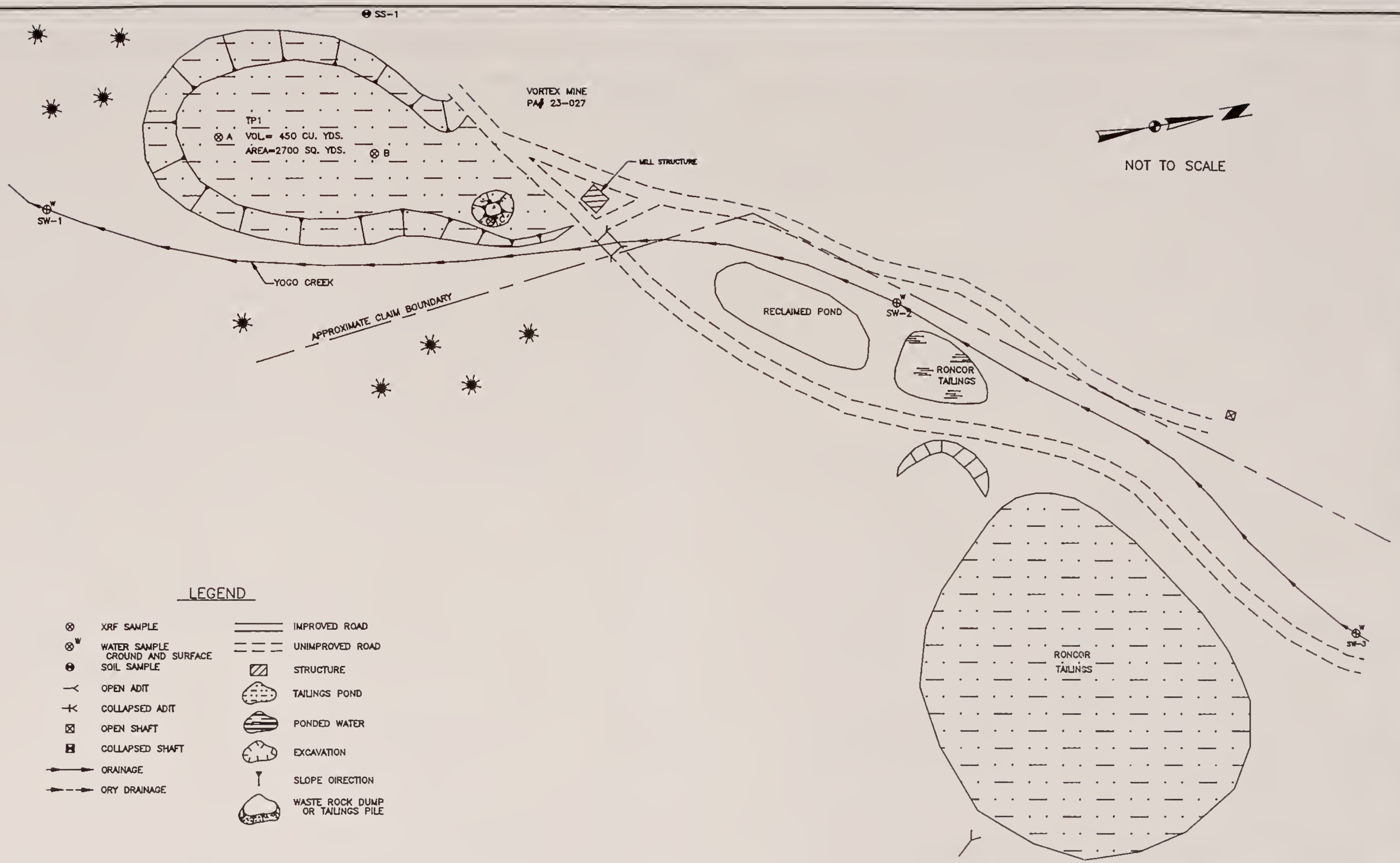
Origin of Ore Milled - Custom Mill___ Dedicated Mill X **; Number and names of mines that supplied mill feed:**

Process? Hg-amalgam, CN⁻ leach (vat, heap), floatation, smelting?
Wash plant



PIONEER
TECHNICAL SERVICES, INC.

RONCOR/AMAX SAPPHIRE, P.A. NO. 23-501
T13N, R11E, SECTIONS 20 & 21
SCALE: 1" = 1000'



DRAWN FOR:

PIONEER
TECHNICAL SERVICES, INC.

TITLE:

RONCOR AMAX SAPPHIRE MINE
PA# 23-501

DRAWING NO.: PT340263
REV: -
DATE: 12/3/94
PLOT SCALE: 1 = 110

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. **Waste Characteristics** - *Use table on following page.*

Unique source identification: (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures/vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. **TAILINGS IMPOUNDMENTS** - *If tailings impoundments are also present, complete the following questions.*

Describe the tailings grain size distribution (approximate % sand, silt, & clay): Most of the tailings are fine clays, limestone fines from wash plants

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): Not determined

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Tailings appeared to be approximately 75% dry.

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): The impoundments were bermed and appeared to be in good condition. Some revegetation work had been initiated.

Comments on potential for mitigation: Grading and revegetation

SOURCE INVENTORY FORM

SAMPLERS: ________________________

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.									

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: ________________________

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No_X_, Number:____ Identification:__________

Filled shafts: Yes___, No_X_, Number:____ Identification:__________

Seeps/Springs: Yes___, No_X_, Number:____ Identification:__________

Groundwater wells within 4 miles?: Yes_X_, No___;
Number of well logs:_10___

Distance to nearest well used for drinking:
___<1,000 ft;___1,000 ft to 0.5 miles;_X_>0.5 miles.

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable____, Possible____, Unlikely_X__.
Very low concentrations of heavy metals in this material.

Approximate Depth to Groundwater:_X_<25 ft;___ 25 - 100 ft;___ >100 ft.

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

SAMPLERS: ____________________

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.												

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ____________________

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X , No ___, Name(s): Yogo Creek

Dry streambeds: Yes ____, No X , Name(s):

Other surface water: Yes ____, No X , Name(s)/Description:

Waste materials within any floodplain: Yes X , No ___ **Source ID(s):** All wash plant tailings are within the 10-year floodplain.

Approximate Flood frequency? ___1 yr, X 10 yr, ___100 yr

Estimated seasonal flow of stream(s) (cfs/gpm)? 4 cfs
High Flow: 50 cfs , **Average Flow:** 5 cfs

Distance between waste source(s) and nearest surface water body (ft)? 10 to 15 feet

Surface water draining onto or through waste sources: Yes X , No ____, **Describe:** Storm water runoff over large disturbed area would discharge to Yogo Creek.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?) Irrigation, stock watering, fishery

Observed erosional/sedimentation/stream turbidity problems? Yes X , No ______. **Distance downstream (ft)?** 0-500___; 500-1,000___; >1,000 X . **Describe/explain** (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Visual sedimentation problems both up and downstream of this site.

SURFACE WATER INVENTORY FORM

SAMPLERS: Bullock, S. Babits

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC $\mu S/cm$ @ 25°C	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-2	SW	Downstream of the majority of the Roncor workings and above the Vortex	8.3	154	NM	185	4 cfs (E)	23-027-SW-2	09/10/93 1050	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3, TSS
SE-2	SE	Downstream of the majority of the Roncor workings and above the Vortex	N/A	N/A	N/A	N/A	N/A	23-027-SE-2	09/10/93 1050	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3, Mechanical
SW-3	SW	Upstream of Roncor workings	8.6	191	NM	207	4 cfs (E)	23-027-SW-3	09/10/93 1151	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3, TSS
SE-3	SE	Upstream of Roncor workings	N/A	N/A	N/A	N/A	N/A	23-027-SE-3	09/10/93 1151	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3, Mechanical

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): Data collected during the Vortex site investigation. NM = Not Measured.

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	*(SO_3)*
Presence of evaporative salt deposits?	*(ESD)*
Discolored or turbid seepage?	*(SPG)*
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	*(FEOX)*
Presence of burned or stressed vegetation?	*(VEG)*
pH ≤ 5.0	*(pH)*

General Potential for AMD Mitigation:

Area available for treatment (acres)? No AMD potential

Wetlands present: Yes____, No X, Describe:

Carbonate rocks/soils: Yes X, No____, Describe: Abundant limestone

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10____; 10-30 X; 30-100____; 100-300____; 300-1,000____; 1,000-3,000____; 3,000-10,000____; 10,000 or greater____; Comments

Nearest residence:____<1,000 ft;____1,000 ft - 0.5 miles; X >0.5 miles.

For each source (table next page):

Available fine materials? *Surface area?*

Uncovered and unvegetated? *Wet or dry?*

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS:

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
No samples were taken.						

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes_X_, No_____,
Describe: Vortex workers

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___;
300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments None

Evidence of recreational use on site: Yes___, No_X_, Describe:________

Accessibility (check each that apply):___Easily accessible - no fences, gates, or warning signs;_X_Moderately Accessible - barbed wire fences, road gated, or signs posted;___Difficult Access - chain-link fence, road gated and locked, site guarded (does not include locked or manned access points located more than 0.5 miles from the actual site).

Sensitive environments on-site or adjacent to site:
State or National Parks - Yes___, No_X_, Comment________
Wilderness Area - Yes___, No_X_, Comment________
T&E Species Habitat - Yes___, No_X_, Comment________
Bat Habitat - Yes_X_, No___, Comment Large, open adit

Primary Drainage___; Secondary Drainage_X_; No Information___:
Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium___, Low_X_
Fisheries Habitat and Species Classification - 4
Sport Fishery Classification - 4

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, No___, Number_2_, types and locations:___
Large adit and shaft on hill above site

Hazardous structures: Yes___, No_X_, Number____, types and locations:_

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____,
types and locations:________

Unstable waste piles, impoundments, undercut banks: Yes____, No_X_,
Number____, types and locations:________

Fire and/or Explosion hazards: Yes___, No_X_, Explain:________

Bibliography

MBMG, Well Log Database, July 14, 1994.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Vortex, Prepared by Chen-Northern, August 26, 1989.

MDSL/AMRB Files, Hazardous Materials Inventory Project Report, Vortex Site, P.A. No. 23-027, 1994.

MDSL/Hardrock Bureau, Small Mine Exclusion Statement for Roncor, Inc., April 16, 1992.

USGS, Topographic Maps, Indian Hill and Woodhurst Mountain, Montana, 7 1/2 minute Quadrangles, 1970.

LABORATORY ANALYTICAL DATA

RONCOR/AMAX SAPPHIRE
PA NO. 23-501

Roncor/Amax Sapphire PA# 23-501
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER-BULLOCK
INVESTIGATION DATE: 9/10/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
23-027-SE-2	15.2	468	1.3 U	9.86	45.2	23.9	17000	0.045 U	392	44.4	21.9	9.17 UJ	90.9	NR
23-027-SE-3	14	385	1.0 U	8.21	37	19.5	15000	0.052 J	322	36.9	14.7	7.2 UJ	61.9	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

MECHANICAL ANALYSIS

FIELD ID	% CLAY	% SAND	% SILT	% COARSE MATERIAL (>2mm)
23-027-SE-2	10	63	27	0
23-027-SE-3	4	63	33	0

WATER MATRIX ANALYSES

Metals in Water Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	CALC. (mg CaCO3/L)
23-027-SW-2	1.38 JX	98.4	2.57 U	9.7 U	6.83 U	1.55 U	102	0.12 U	4.08 UJ	12.7 U	1.47	30.7 UJX	7.57 U	188
23-027-SW-3	0.96 U	110	2.57 U	9.7 U	6.83 U	2.47 J	99	0.12 U	4.08 U	12.7 U	0.72	30.7 U	8.17	203

Wet Chemistry Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	TOTAL SUSPENDED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE	TSS
23-027-SW-1	267	< 4	< 5.0	12	< 0.05	NR	< 4
23-027-SW-2	247	< 4	< 5.0	14	< 0.05	NR	< 4
23-027-SW-3	265	< 4	< 5.0	14	< 0.05	NR	< 4

LEGEND

SE2 - Between exposed and reclaimed pond, owned by Ronco. Downstream of shaft.
SE3 - At Ronco intake pond above Ronca tailings, downstream of placer tailings.
SW2 - Same as sample SE2.
SW3 - Same as sample SE3.